Subterranea

The Magazine for Subterranea Britannica

Subterranea Britannica **August 2021 Issue 57**

IN THIS ISSUE

18th-century tunnels of Gibraltar
A German Channel Tunnel
Paul Sowan - An appreciation
Barnton Quarry Restoration Update

Subterranea Britannica is a society devoted to the study of man-made and man-used underground structures and the archaeology of the Cold War. The society is open to all and its membership includes all walks of life.
Members are invited to contribute to this magazine even if this just means sending very welcome snippets from newspapers and magazines.
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Front cover photo: *Progress in the R4 operations room in Barnton Quarry, Edinburgh. We've been working top to bottom to restore the cabins around the ops well to their original 1952 ROTOR configuration. The R4 ceiling restoration was a particularly tricky challenge for us considering the location and the condition of the troughing after the fire. Sandblasting back to bare steel, then application of a two-pack paint, mixed to the original Ministry of Works Spraycrete colour. Note the new steel joists supporting the middle floor cabin.*

Back page upper: *Star Chamber, the centre of the complex of galleries, chambers and underground gun emplacements lying between the King's and Queen's Lines of Gibraltar's Northern Defences. Excavated in 1790 out of an existing cave system, it is believed to have served as the base for the eighteenth century miners' tunnelling in this area. The brick structures and concrete blast wall date from WWII when the Chamber served as the HQ of the 2nd Bn, The King's Regiment. However, the viewpoint is from the start of Lower Prince's Gallery, also dating from 1790. This is a long underground gun ramp which connects this level of the Northern Defences with the Prince's Lines, some 70 feet higher up the hillside. Photo Tim Wellburn*

Back page lower: *Barnton Quarry Ops Room upper level in 1999. When Barnton Quarry became a Regional Seat of Government (RSG) in the early 60s floors were built across the open ops well on the two upper levels. These floors were largely destroyed during the fire of 1992 revealing the original open well. During the restoration this floor was removed bringing the ops room back to its original condition. Photo Nick Catford*

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The committee of Subterranea Britannica and the Editor do not necessarily agree with any views expressed and cannot always check the accuracy of any material sent in.

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Chairman's Welcome

Tim Wellburn

Paul Sowan, holding court in characteristic mode, Arras, France Sub Brit Study Weekend, May 2009. Photo Clive Penfold

Martin Dixon remarked to me how the last issue of *Subterranea* served to highlight the parlous state of many historic sites, with neglect or 'development' continuing to erode our underground heritage, its related surface buildings and infrastructure. True, that issue charted some successes – notably the successful listing of Buckden ROC Posts and the restoration and conservation work belatedly carried out on the appallingly neglected Corsham telephone exchange. But elsewhere the news was more ominous.

Oxgate Admiralty bunker – the only one of the north London citadels to retain its distinctive surface building – is threatened with demolition; Sub Brit has now done what it can in making the planning case for its preservation. As we know, its neighbour, Paddock, remains in limbo: inaccessible and doubtless flooded and deteriorating, although we will continue to fight its cause. The Halstead group of air-raid shelters, for which we provided financial and moral support to the impressively proactive local conservation group, remain at risk.

The WT Henley air-raid shelters at Northfleet are now threatened with 'redevelopment', as is the unique Pear Tree House war room in south London. The Drakelow complex is undergoing partial conversion into a bonded warehouse – although a museum is mooted, and Hope Cove has recently been under the auctioneer's hammer. The Ace High dishes at Stenigot are another piece of our history now lost to us forever.

The recent death of Paul Sowan marked another and immeasurably greater loss: a man who had become an institution in his own right, passionately committed to the fight to hold back the seemingly inexorable tide of ignorance, greed or simple indifference that continues to threaten obliteration of the physical evidence of our history. It was only a couple of issues back that I recorded that Paul had finally hung up his Sub Brit committee hat after 35 years' service.

I will not anticipate the Appreciation, written by Martin and published elsewhere in this issue, save to repeat that we are unlikely to see such a Titan in future; we will remember him fondly, and remain immensely grateful for all his tireless work in advancing the cause of conservation.

Sub Brit will continue to pursue this work, through arguing the case for the retention and listing or scheduling of significant heritage structures, and supporting individuals, groups or organisations with similar objectives.

chairman@subbrit.org.uk

SUBTERRANEA BRITANNICA DIARY

Summary of Forthcoming Events

Sub Brit specific events

2021

17 September Site Visit to East Sheen air-raid shelter

9 October Committee Meeting, online

16 October Autumn Meeting at Sywell Aerodrome

17 October Site Visits, Northamptonshire

1 November Copy deadline for *Subterranea* 58

Mid-December *Subterranea* 58 published

2022

15 January Committee Meeting – Canada Water

1 March Copy deadline for *Subterranea* 59

12 March Visit to Dumpy Level, Dover Castle – Trip 1

April *Subterranea* 59 published

23 April AGM plus Spring Day Meeting – Canada Water

and more Future Events in the pipeline
(dates to be confirmed as soon as Covid allows):

* Autumn 2022 Scotland Weekend including Barnton, Edinburgh

* London Mail Rail walks 5 & 6

* Extended Mail Rail Walk

* Maginot Line Trip

* More "In the Dark Webinars" – please offer to do one!

For web links to these events please visit *www.subbrit.org.uk/events*

If you know of other relevant events run by other societies, please let us know so that they can be advertised in the next edition and on the website

Subterranea Britannica Annual General Meeting 2021 – Minutes

Saturday 27 March 2021, online using GoogleMeet, due to the ongoing Covid-19 lockdown

The meeting was opened at 10.00 by the Chairman, Tim Wellburn, who welcomed all those attending. Seventy-one members were present. The online platform allowed members to see each other, along with a set of slides covering the content of the meeting. Attendees had the facility to add comments/questions, by typing them in.

1. Apologies were received from:

   Terry Tracey, Charles de Winton, Michael Higgins, Neil Iosson, Nick Gould.

2. The Minutes of the AGM 2020 held on 31 October were published to all members in *Subterranea* #55*,* December 2020*.* It was proposed by Richard West and seconded by Robin Cherry that the Minutes were a true reflection of the meeting; the proposal was accepted by those attending with four abstentions.

3. Annual Report for the year ended 31 December 2020. This has been published to all members on the Sub Brit website. Tim highlighted a few of our achievements of 2020:
   - Strong financial position
   - Membership at year-end = 953: down 9% on 2019 year-end; Tim encouraged members to invite their friends to join to boost numbers
   - 11,000 subscribers to social networking channels
   - 75 million 'hits' on website www.subbrit.org.uk; Richard Seabrook (our webmaster) attributed this to the substantially increased content of our website
   - 'In the Dark' Webinar programme – available free to the public; over 3000 people have watched 17 sessions to date, with more than 11,000 views on Youtube
   - Three new issues of *Subterranea* & wide-ranging Members' online Forum
   - Public online archive of *Subterranea* Issues 1–48 with searchable index
   - Grants of £11,500 approved for underground organisations.

4. Accounts 2020: Sub Brit's Accounts have been signed off by the Committee and Independent Examiner and have been filed at Companies House and the Charity Commission.

5. Elections of Officers and Committee. Tim recapped changes at the last AGM:

   Joined: Neil Iosson (previously co-opted)

   Appointed: Tim Wellburn: Chairman

   Richard West: Vice-Chairman (and remains Membership Secretary)

   The motion that nominations for Sub Brit's Committee be considered *en-bloc* was proposed by Charles Bicheno and seconded by Brian Matthews. The motion was carried with two abstentions.

6. The motion to elect the following Committee members was carried with one abstention.

   The elected Committee for 2021/22 is:

Tim Wellburn	Chairman
Linda Dixon	Secretary
Tony Radstone	Treasurer
Richard West	Vice Chairman and Membership Secretary
Richard Seabrook	Member (Webmaster)
Phil Catling	Member (SB Meetings)
Jason Hughes	Member (Shop mailings)
Neil Iosson	Member (Website content manager)
Martin Dixon	Member
Bob Templeman	Member
Chris Gray	Member

7. Tim finished by outlining some proposed future events:
   - SB Autumn Meeting and Site Visits, Sywell, Northamptonshire, 15–17 October 2021
   - Dumpy Level, Dover – rebooked for Sat 12 March **2022** with follow-up trip (date tbc)
   - Others in the pipeline (dates to be confirmed as soon as Covid allows)
     - 'Mail Rail' Walks 5 & 6
     - Extended 'Mail Rail' Walk
     - Maginot Line Trip
     - SB Europe Study Weekend, Oslo
   - More "In the Dark Webinars" – please get in touch if you are able to offer a talk.

   The Meeting officially closed at 10.17am.

Summary Minutes of Sub Brit Committee Meeting 19 June 2021, held Online

Due to the Covid-19 restrictions, the Committee decided to hold the meeting online, which again worked successfully.

Participating

Tim Wellburn (in the Chair), Phil Catling, Chris Gray, Tony Radstone, Richard Seabrook, Bob Templeman, Richard West, Jason Hughes, Martin Dixon, James Buller, Nick Gould, Neil Iosson and Linda Dixon.

Membership

Tim formally welcomed James Buller (from the Social Media team) and Nick Gould, who have been co-opted to the Committee since the AGM. The Committee held a minute's silence to mark the sad and unexpected passing of our ex-Chairman, Paul Sowan, and arrangements were discussed for the funeral and the handling of Paul's Estate.

Matters arising from Reports

Most of the Committee posted reports to the Forum, which were discussed.

- There was a small issue with late renewers not receiving the April *Subterranea*. It was stressed that members must renew asap after their renewal date, in order to ensure they do not miss a magazine.

Autumn Meeting (16 October) & Visits (15th & 17th) 2021, Sywell, Northamptonshire

Phil reported that he is working with Adrian Armishaw; most of the speakers and visits are lined up.

Costs to be finalized and then booking will open in the early Autumn (see Panel in *Subterranea* 56).

Spring Meeting and **Annual General Meeting 2022**

We are planning for this to be held in person, at a London venue. Linda and Tony are investigating venues and dates; Phil will source speakers.

Autumn Weekend 2022

We are planning for a weekend in Edinburgh, based round Barnton Quarry. Neil will progress this.

Membership Questionnaire

The Committee discussed re-running a questionnaire (last run in 2011) to determine members' preferences. Tim will progress this.

"In The Dark" Webinars

Thanks were given to Tony for championing these new seminars online for SB members, which are also open to the general public. There have been 22 to date, a huge effort, and we've had over 25,000 views. The programme will resume in the Autumn.

Insurance

After some discussion, we agreed to renew Sub Brit's Liability Insurance policy on current terms. Neil will investigate any further options.

Trips and visits

Various thoughts are being progressed – these will be announced to the membership once they are firmed up.

Next Committee meeting

Saturday 9 October 2021, Online.

Blisworth Tunnel on the Grand Union Canal is one of the sites to be visited during the Autumn Meeting weekend at Sywell 16 - 17 October. We will be taking a boat trip through the tunnel

NEWS

Miscellany compiled by Nick Catford

NEWS – ARCHAEOLOGY

Mexico will re-bury an Aztec tunnel

The cost of dealing with the coronavirus pandemic has forced Mexican archaeologists to re-bury an ancient passageway that combined colonial and pre-Hispanic features. In 2019, the National Institute of Anthropology and History announced it found a flood-control tunnel on the outskirts of Mexico City that had Spanish construction techniques but Aztec symbols carved into it.

The institute planned to make an exhibit of the strange tunnel, built in the early 1600s to replace an earlier Aztec flood-control system built in the 1400s to protect Mexico City, then an island surrounded by shallow lakes, against periodic floods. In mid-July the institute announced archaeologists would simply cover the finds with dirt again, in hopes that someday it would have enough funds to build a display.

Experts speculate the pre-Hispanic symbols may have been placed by Indigenous laborers who were the main workforce during its construction. Carved pre-Hispanic stones were sometimes used in colonial-era churches and houses, in part because the Spanish used rubble from demolished Indigenous structures as building material. Montezuma, or Moctezuma, was the second Aztec emperor, ruling from about 1440 to 1469.

He was followed by Moctezuma II, the emperor who confronted – and ultimately succumbed to – Spanish conquistadors led by Hernan Cortes. The Aztecs were renowned for their agriculture – draining swamps, introducing irrigation, and creating artificial islands in the nearby lakes. Their civilization also developed a form of hieroglyphic writing, a complex calendar system and built famous pyramids and temples. But the Aztec stones found in the tunnel appeared to be prominently and intentionally displayed.

Adorned with carvings and paintings, the passageway is believed to have been ordered built by Emperor Montezuma I and was associated with Tlaloc, the Aztec god of water and fertility. Although Tlaloc was seen as a giver of life, Aztecs also feared him because they believed he sent down hail and lightning and had the ability to poison their water sources.

SOURCE: *MailOnline,* 23 July 2021

2000- year-old banqueting hall discovered in Jerusalem

Archaeologists in Jerusalem have discovered a once opulent banquet hall that may have welcomed VIPs on their way to visit the nearby Temple Mount 2,000 years ago. It had two chambers separated by a hallway decorated with a 'magnificent' fountain and Corinthian capitals. They said it may also have acted as a city hall before later being divided into three chambers to add a pool or ritual bath as future rulers put their own stamp on the grandiose structure.

Today the hall lies beneath Jerusalem's Muslim Quarter and is accessed by the Western Wall Tunnel, an excavation that runs along the western flank of Temple Mount, one of the world's most contested religious sites. Experts think the building was mostly likely run by the city's Jewish leadership at the time, and may have welcomed Pagan guests.

The building dates back to approximately 20–30 AD. The building, which apparently stood along a street leading up to the Temple Mount, was used for public functions. It may even have been the city council building, where important dignitaries were received before entering the Temple compound and the Temple Mount. The excavation revealed that the hall, which is now being opened to the public, was no longer in use by the 7th century.

SOURCE: *MailOnline,* 13 July 2021

Derbyshire cave house identified as ninth-century home to exiled king

In the 18th century, Anchor Church cave in south Derbyshire was used by local gentry as a place for parties, and until now it was officially understood that that was as far back as its history went. But archaeologists now believe the cave house can be dated to 1,200 years ago, probably lived in by Eardwulf who was deposed as king of Northumbria in AD806 and died in AD830.

The cave house is Grade II listed as a natural cave enlarged in the 18th century but archaeologists now believe it's not a natural cave, stating there is no natural

process that makes walls, doors and windows, let alone pillars. Everything about the cave – the narrowness of the windows, for example – pointed to Saxon architecture.

One local legend links the site to Saint Hardulph, previously King Eardwulf. It has now been suggested that Eardwulf lived there as a hermit, where his enemies could keep an eye on him, in caves that were constructed or enlarged to house him.

The discovery makes it probably the oldest intact domestic interior in the UK. We have churches from this kind of date but we haven't got anywhere where people slept and ate and prayed. Cave dwellings had often been overlooked by historians but they may be the only intact domestic buildings to have survived from the Saxon period.

The archaeological team believe the caves were modified in the 18th century when it was recorded that Sir Robert Burdett "had it fitted up so that he and his friends could dine within its cool and romantic cells." This included widening openings so that well-dressed ladies could pass through.

SOURCE: *The Guardian,* 15 July 2021

Archaeologists explore Istanbul's Byzantine basements

The winding streets of old Istanbul are an overlapping cacophony of seagulls, ship horns and vendors of colorful fresh fruit. Shady fig trees cluster near crumbling Byzantine walls and sweeping Ottoman palaces, remnants of the empires that conquered and lost this strategic point on the Bosporus Strait, which formed the seat of the Eastern Roman Empire. Underneath it all is an ancient world that's almost invisible, unless you know where to look.

"Can you imagine my excitement when I saw this for the first time?" exclaims archaeologist Ferudun Ozgumus, as he leads the way down a rickety wooden staircase into a cavernous structure deep beneath a carpet shop. "It was full of debris as far as that corner of the arch," he says, pointing across the space to a point 15 feet overhead. "We were crawling!"

For more than 20 years, Ozgumus has knocked on the doors of Istanbul's oldest neighborhoods and asked to see the basement. At 64, the Istanbul University professor is one of the first archaeologists in Turkey devoted to studying the city's underground spaces. He has identified more than 300 sites, and he knows there are hundreds more.

As soon as you step inside the corridor of the carpet shop basement, the temperature drops. Arches, at least 20 feet high, are evenly spaced through the structure. Water drips from the ceiling, and as you look up, you see swirls of bricks – thin and rust-colored, alternating with thick stripes of mortar.

Ferudun Ozgumus (left) walks through a carpet shop above a basement containing Byzantine-era ruins

This particular site, Ozgumus believes, may be related to a sprawling palace built by Constantine the Great, the 4th-century Roman emperor and founder of ancient Constantinople. But it's hard to know for sure. Many Byzantine-era buildings that are mentioned in archival documents have been lost to history, such as Constantine's famous palace reception hall. No one has ever found it. Ozgumus' working theory, based on the bricks and the shop's location, is that this structure may have been a storage basement underneath that palace reception hall. But this idea can only be confirmed by additional excavations.

Throughout Istanbul, there are clues to how residents of the Byzantine capital lived, worked in and built their city. These blend in with the current surroundings: The ruins of an ancient Roman bathhouse frame the boiler room of a modern office building. A 6th-century cistern with blinding-white columns serves as a jewelers' workshop, with machinery to etch out silver necklaces and rings. After Ozgumus completed a 13-year archaeological survey of Istanbul's historic peninsula in 2010, younger scholars have continued his work, adding hundreds of sites to the public record.

These sites form the basis of a small but growing line of underground tours, in which visitors can navigate narrow passages to see ancient brickwork, cisterns and frescoes from long-forgotten churches.

SOURCE: SFES *Newsletter* No 236, July 2021

NEWS – CONSERVATION AND HERITAGE

New dates for Mail Rail tunnel walks

The Postal Museum in London is pleased to announce new dates for our popular Tunnel Walks taking place at 15.00, 15.30, 18.00 and 18.30 on the following Tuesdays in 2021:

7, 21 and 28 September

5, 12, 19 and 26 October

2, 9 and 23 November

Walk through the unique network of tunnels under the city with expert guides who bring the history of Mail Rail to life with surprising stories about the staff who built, operated and maintained the underground railway over the course of 100 years.

SOURCE: Postal Museum, July 2021

LT Museum launches a virtual tour of Brompton Road station

Located between Knightsbridge and South Kensington stations on the Piccadilly line, Brompton Road station was closed in 1934 after the Piccadilly line was extended. It was closed along with stations such as Down Street and York Road as they were only lightly used – with some services passing through without stopping.

Visiting the station is now impossible as the only access is by walking along the track from South Kensington but you can have a behind-the-scenes digital tour to learn about its time as a WWII gun operations room and see what the disused station looks like today. The 90-minute Zoom tour (link will be emailed by the museum) costs £20 and includes a Q&A session afterwards, where you'll get the chance to ask our expert guides all about Brompton Road station.

Photo Nick Catford

The museum launched the virtual tours on two dates in August; for future dates contact the museum or sign up for the museum's monthly enewsletter by visiting www.ltmuseum.co.uk/hidden-london#enewsletter

SOURCE: London Transport Museum, July 2021

Czech nuclear bunker Denis opens to the public

In May a nuclear bunker in Brno, a city in the South Moravian region of the Czech Republic, opened to the public for the first time. This civil defence facility will enrich the already ample collection of attractions beneath your feet in Brno, such as the Reservoirs on Žlutý kopec, the Labyrinth under Zelný trh, Constance at Sv. Jakub's Church, or the Mintmaster's Cellar under Dominikánské námestí.

'Denis' is a 66-year-old shelter that has been kept as untouched as possible: empty corridors, old equipment, personal belongings stored here and there… every effort was made in the name of authenticity.

The shelter was excavated into the massif below Petrov in three stages between 1946 and 1955, gradually extending to the current system of 900 meters of corridors, going down to 35 meters in some areas. The complex has three entrances from the corner of Nádražní and Husova, as well as emergency exits leading to the Capuchin Gardens and directly into the cellars of the Capuchin Monastery. In the event of a serious emergency, up to 3,000 people could hide in the corridors.

It was important for us to keep the shelter in its raw form so that visitors can imagine what it would be like to survive there for 3 to 4 days. Each of the underground facilities is something special and unique. With their diversity, scope and design ingenuity, they amaze not only tourists, but also Brno residents themselves. To ensure that no detail is lost, guided tours are provided.

The Denis bunker will open as soon as government regulations allow. To find out more about individual tours, prices, and rules for visitors, see the Brno Underground website: www.brnenske-podzemi.cz/

SOURCE: *Brno Daily,* 24 May 2021

Tunnels of Rome's Colosseum fully opened to public

For the first time, visitors to the Colosseum in Rome can fully explore the underground tunnels and chambers where gladiators and wild animals once prepared for battle.

Spread across 15,000 square metres, the hypogeum of the 2,000-year-old monument is open to the public following the completion of a restoration project funded by the Italian fashion house Tod's. Although people have been able to descend into the hypogeum network – which lies beneath what was the amphitheatre's arena and was invisible to spectators in ancient times – since 2010, they could enter only a small section. Now there are walkways allowing visitors to explore the tunnels and chambers.

More than eighty archaeologists, architects and engineers were involved in the two-year project to restore the tunnels. There was much criticism when Italy's culture minister announced several public-private partnerships for the renovation of Rome's monuments.

The restoration of the hypogeum is the second part of a three-phase project on the Colosseum that began eight years ago and for which Tod's has paid a total £21m. The first phase focused on a clean-up of the Colosseum's facade, and the final part, expected to be completed in 2024, will involve restoring the galleries and lighting system as well as adding a new visitor centre.

Meanwhile, a project to restore the floor of the Colosseum to its former glory is expected to be completed in 2023. The new, hi-tech stage, which could host cultural events, will be able to quickly cover or uncover the underground networks, allowing them to be protected from the rain or to be aired out. In Roman times, crowds would fill the Colosseum to watch gladiators defeat animals including bears, tigers, elephants and rhinoceroses.

SOURCE: *The Guardian,* 25 June 2021

Open Day at Alconbury USAF bunker

Alconbury Weald is a new residential development on the former Alconbury airfield in Cambridgeshire. Alconbury Weald is rich in military heritage and offers an abundance of stories spanning its time as an RAF airbase. Several historic landmarks remain on the site and Urban&Civic the property developer has worked on their retention and conservation, integrating them into the newly created mixed-use development.

There is now an opportunity to explore the Watch Office (control tower), a Grade II listed building originally built in 1940–1 as a central operations building for the whole airfield during the Second World War. The building has been restored to its former glory and is now a popular café and eatery. Sample a wartime themed menu whilst enjoying a range of performances and military vehicle demonstrations on Watch Office green.

'Magic Mountain' the 1989 bunker. Photo Nick Catford

Take one of four one-hour tours around the unique Cold War-era military bunker which was designed to survive a direct nuclear attack. The Grade II building was completed in 1989 and was one of the largest in the UK. Built to process intelligence data collected by the TR1 reconnaissance aircraft, it is one of the UK's most sophisticated buildings of its kind. Guided tours of the bunker will be available to book near to the time of the event.

Alconbury Weald's Heritage Open Days will encompass ancient and modern history, education and fun for all the family. The next open day is Saturday 11 September 09.30 – 1800. Book a free tour of the bunker online at www.eventbrite.co.uk/e/alconbury-weald-heritage-open-day-tickets-165098665553?aff=ebdssbdestsearch

SOURCE: History of Alconbury Weald website

NEWS – HEALTH & SAFETY

Worker injured in the sewers of Paris

A contractor injured while working underground in the sewers in Paris' 19th arrondissement on 15 July was rescued by the fire brigade. For this operation they called in the Grimp (group of specialists for intervention in dangerous places).

The Grimp is a specialist team of brigade members trained and experienced in operations in dangerous environments. The rescued worker was taken to hospital.

SOURCE: Translation of SFES newsletter item, July 2021

NEWS – MILITARY AND DEFENCE

Fearn Airfield

Martin Briscoe reports that some years ago Sub Brit visited Fearn Airfield and its Operations Block in Scotland. At that time it was very overgrown. The vegetation has been removed as well as the earth covering of the building so it can be seen very clearly now.

Fearn airfield (also known as Balintore airfield, RAF Fearn, RNAS Fearn or HMS 'Owl') was 21 miles north-northeast of Inverness in the north of Scotland.

The airfield was built in 1941 as RAF Fearn, intended as a satellite to RAF Tain. However, the RAF used the airfield very sparingly and the site was transferred to the Royal Navy in the summer of 1942, becoming HMS Owl. The Fleet Air Arm operated a torpedo training school at Fearn with several units flying the Fairey Barracuda from the spring of 1943. Small numbers of Fairey Swordfish and Avro Ansons were also used here, the Ansons being used for radar training.

The Operations block now devoid of its earth cover. Photo Martin Briscoe

The Navy continued to use Fearn for both training and operational flying with most units having relatively short stays. Barracudas were the main aircraft flying from Fearn during the war, although Fairey Fireflies and a few other aircraft types also joined them at various times.

Following the end of the war, all units had disbanded or left the airfield by the spring of 1946 and Fearn was soon handed back to the RAF. There was some use by the RAF from 1952 and 1953 as a Relief Landing Ground for Airspeed Oxfords based at Dalcross, storage use also occurring prior to the site being officially disposed of.

Many of the airfield buildings survive and the main four-storey naval control tower has now been converted into a house. The three runways are still visible and one has occasionally been used by propeller aircraft carrying out circuit training. The dispersal areas can also be clearly seen and a few hangars remain.

Fearn was originally tentatively alternatively suggested as having its name as Clay of Allan while being built, and in more recent years has also become known as Easter. Easter is now used as a private airstrip.

SOURCE: Martin Briscoe and *Airfields of Britain* website

HMS Forward offered for sale for a nominal fee

In May it was reported on the Sub Brit forum that the entrance to the HMS tunnels in Newhaven was for sale. On the 20 June 1940, the Guinness Trust Holiday Home at South Heighton (Newhaven) became a Royal Naval headquarters known as HMS Forward. Excavation of a tunnel network commenced in May 1941. It was completed by 14 November 1941 and used until decommissioned on 31 August 1945. From the underground headquarters HMS Forward maintained a comprehensive maritime surveillance of everything that moved on, under or over the English Channel from Dungeness to Selsey Bill.

A group called Friends of HMS Forward was formed in November 1999 with the objective of restoring the former HMS Forward tunnels to a standard conforming with current legislation suitable for public access as a site of historic interest. During their research they discovered that 1970's residential development of the hillside had resulted in ownership of the tunnels becoming fragmented under English Law. One of the land owners in particular was adamant that he wouldn't allow anyone to enter the section of tunnel under his property. The Friends of HMS Forward was disbanded in 2007 and since then the tunnel network has remained in limbo. Officially there has been no access but the tunnel entrance although sealed has been opened from time to time by urban explorers.

Entrance to the tunnels. Photo Nick Catford

Earlier this year a plot of land including the entrance, and a plot across the road for parking was offered for sale for a nominal fee to the Wealden Cave and Mine Society. WCMS decided that because of its location in Newhaven the club was unable to take on responsibility for securing the tunnels stating "HMS Forward is outside our core physical location and it would be very difficult for us to monitor the security arrangements which we use as standard for the mines and tunnels within our core locations, and to respond quickly to any incidents. For that reason we regretfully must decline your offer." So the tunnels remain in limbo until someone offers to take it on.

Editor's note: I have details of the owner if anyone wants to take this on as a project.

SOURCE: Sub Brit website and Stuart Goldsmith, Wealden Cave and Mine Society

Fight to save Canadian Cold War bunker from demolition

Historians are pushing to save a Cold War-era nuclear fallout bunker in Kitchener's Schneider Park from demolition as the shelter's fate is set to be determined by Region of Waterloo council this summer.

The association has launched a petition pushing the regional council to keep the shelter standing and convert it into an educational site. The 5,700 sq ft shelter was built in 1966 during the height of the Cold War amid the looming threat of nuclear attacks.

It was designed to hold up to forty people for weeks on end, with heating, water and sewage built in. A local rowing club used the bunker for storage for about 20 years until 2018, before the shelter was locked up after a hazardous material assessment flagged extensive structural damage to the building.

The historic shelter remains one of the Canada's largest standing municipal Cold War-era bunkers. City officials have already completed a heritage impact assessment, but are also looking into environmental impacts of demolition as well as the structural integrity of the shelter. Last autumn staff pegged the cost of demolition at about $225,000 – significantly less than the price to restore the site.

While the fate of the bunker remains in limbo ahead of a final staff report and decision at a council meeting in June, Reesor said he's disappointed to see the bunker sit idle and face vandalism. The battle to save the bunker is now drawing allies from the Canadian Civil Defence Museum and Archives in Alberta.

On 1 June it was reported that regional councillors voted against a plan to repair Kitchener's Cold War bunker. The shelter was discussed at a committee meeting and councillors decided not to proceed with $700,000 repairs. The shelter has damage from water and mould, and it's not safe to go inside it right now.

The repairs would have waterproofed the building and stabilized the structure while a decision is made about its future. Councillors are divided on whether or not the shelter is worth saving and have now asked for a staff report within three months outlining potential uses for the shelter.

SOURCE: CTV *News*, 4 May and 1 June 2021

Nazi bunker found during car park construction in Poland

Builders have uncovered an old WWII bunker built by occupying Germans in the city of Lublin in Poland. Inside they found bullets belonging to both Nazi and Soviet troops leading researchers to believe the construction could have been the site of fierce fighting in 1944.

The bunker was discovered seven metres below the former Group of Clothing and Fabric Schools by builders working on the construction of an underground car park for what will be a new housing block.

The vast wooden construction comprised a staircase with three underground corridors leading from it, each with walls and ceilings encased by wooden beams. The tunnels were excavated using mining techniques. After agreeing the further method of studying and documenting such an unusual discovery with the conservator's office, archaeologists have begun exploring the interior of one of the corridors.

On the so-called 'utility level', archaeologists found several mineral water bottles, produced in Germany and the Czech Republic, as well as the remnants of ammunition fired from both Wehrmacht and Red Army weapons.

The vast wooden construction comprised a staircase with three underground corridors

Following the Soviet Union's invasion of Poland just sixteen days after Germany attacked, Soviet forces occupied eastern Poland until the summer of 1941, when they were driven out by the German army during Operation *Barbarossa*. The area remained under German occupation until the Red Army reconquered it in the summer of 1944.

As a result of the discovery, building work has been suspended while checks are made for unexploded bombs.

SOURCE: *The First News* (Poland), 28 July 2021

New tenant wanted for Salisbury bunker

Salisbury City Council is seeking a new tenant for the former Salisbury Urban District Control Centre at Harnham on the outskirts of the city. It became a telephone exchange after World War II and was modernised in the 1980s. Having been refurbished it has most recently been used as part of the Sound Emporium, a local youth community group.

The City Council wishes to see this building on Old Blandford Road being used by the community for the community, and are seeking proposals from groups and organisations about how this can happen.

The Council is looking for a proposal that will:

• Be inclusive – encouraging and supporting access for all
• Be sustainable – with a sound financial plan for long-term operation
• Have a focus on youth provision
• Increase the vibrancy of Salisbury
• Improve community skills and resilience and build community spirit
• Bring groups together across the city to work together

The entrance tunnel. Photo Nick Catford

The Harnham bunker is located in a small area of woodland at the junction of Old Blandford Road and Grasmere Close at Harnham. The bunker replaced the former control centre for the then District Council in the basement of 'The Council House' at Bourne Hill in 1963.

SOURCE: *Salisbury Radio* website

Development at Ramsgate's forgotten WWII headquarters

Ramsgate's close proximity to the continent has meant that in times of war, the population has had to form a close relationship with the Royal Navy. With the outbreak of the Second World War, Ramsgate's inhabitants welcomed their naval guests once again with the formation of shore-based HMS Fervent. An official flag-raising ceremony took place on 10 October 1939 and various buildings across Ramsgate's waterfront were requisitioned.

Fervent's officers were housed in the grand Royal Temple Yacht Club, accompanied by their wardroom and the base's intelligence library. The ratings were billeted in the old buildings of the *Merrie England* funfair (latterly the *Pleasurama* site). The former bar area and dance floor were converted into the mess decks.

The chalk cliffs, which already housed the town's expansive air-raid shelters, had fresh incisions made to make room for the base's communications centre and storage facilities. The entrance to these tunnels has since been sealed off. The tunnels remain however, covered with graffiti drawn by servicemen long ago.

Fervent's initial tasking of contraband control is one which has received scant attention in the history books which have followed. Contraband control itself came into effect on September 4, 1939, when the Admiralty announced that all merchant vessels were now liable for examination by the naval contraband control service, and any goods bound for Germany subject to seizure.

Given the magnitude of the necessary preparations, the required bases including Fervent were not operational until October. While on hold, selected vessels were held between Deal and the Goodwin Sands, with requisitioned Thames tugs on hand to transport the boarding teams to the waiting vessels.

Entrance to the tunnels that housed HMS Fervent

To carry out searches there were just 42 naval personnel between Ramsgate and Margate by the end of 1939. Many were older, less active reservists, supplemented by inexperienced men called up for wartime service. The dedication of those initial 42 sailors should not be forgotten. From October 1939 to April 1940 they searched 937 vessels, of which 98 were seized, denying Germany's war effort thousands of tonnes of supplies.

HMS Fervent's finest hour came in late May 1940, with the start of one of the most famous episodes of WWII, Operation *Dynamo*. With Allied forces forced to retreat to the town of Dunkirk, the order soon came to prepare for evacuation. Preparations began across the country; with Ramsgate becoming a hive of activity, and the ranks of HMS Fervent swelled to some 650 naval personnel, under the Command of Captain W.R. Phillimore.

He was ordered to make all possible provision for the assembling, maintenance and repairs for the small naval and civilian vessels, which were soon to descend on the harbour. The vast majority of the vessels being assembled at Ramsgate were the now famous "Little Ships".

Over the next nine days, from May 26 to June 4, Fervent's sailors alongside their civilian counterparts worked tirelessly to rescue some 41,327 Allied servicemen. Following the success of *Operation Dynamo*, Fervent's role changed once again, this time supporting vessels engaged on anti-invasion patrols. In January 1941, the role changed for the last time with Ramsgate becoming the overflow base to Dover for units of the Coastal Forces.

Developers behind a luxury seafront scheme at a site left derelict for two decades say people will soon be moving into the first new apartments as construction steams ahead. Blueberry Homes started work on the Royal Sands development in Ramsgate last year and has been working at such speed that the Thanet-based firm is ahead of schedule.

The development involves the creation of 106 luxury apartments, a 60-bed hotel and leisure facilities, including shops and food outlets. The hotel, which will be at the Wetherspoons end, will be one of the final parts built in

the £50 million redevelopment project at what was the old *Pleasurama* and HMS Fervent site.

SOURCE: *Isle of Thanet News,* 25 July 2021

Former Mistley AAOR converted into three luxury apartments

A Cold War bunker at Mistley in Essex was built in 1951 as an Anti-Aircraft Operations Room for the Royal Artillery. The bunker was sold to Essex County Council in 1963 and it became one of four sub-controls reporting to the County Control at Chelmsford.

By 1966 Mistley became the main HQ for the County. From 1968 until the early 1980s Mistley was placed on care and maintenance and in 1984 it finally became the County standby when the County opened the long overdue new control centre in County Hall. The bunker remained fully operational until 1993 when it was decommissioned at the end of the Cold War.

In 1995 the building was leased to the Bunker Preservation Trust, the same team that had helped set up the WWII war rooms (Hellfire Corner) at Dover Castle, Liverpool's 'Western Approaches' museum, the Battle of the Atlantic War Room and Scotland's 'secret nuclear bunker' at Anstruther.

Mistley was renovated and refurbished and opened to the

public at Easter 1996 and after six successful years closed its doors for the last time after a free public open day on 1 December 2002. The bunker was Grade II listed in May 2007.

Developer BuildVantage has now restored and converted the property into three plush duplex apartments. There are also 28 new homes at the site, with prices starting from £550,000. The properties at the former bunker are arranged over two floors, with an evident throwback to the site's past as each home has heavy blast doors made from military-grade tank steel.

It is also protected by 600mm thick reinforced concrete walls. One of the three properties still features the original ventilation system housed behind a glass wall, while each apartment also comes with its own off-road parking and enclosed garden.

The developers claim to have found the perfect balance of combining modern-day luxury with restored original features to create an "extraordinary transformation". All three homes are centred around a communal atrium, with plenty of natural light.

SOURCE: *East Anglian Daily Times,* 3 June 2021 and Sub Brit website

Defence Ministry in Japan launches tours of WWII bunker

The Ministry of Defence in Japan launched a virtual tour of a former Imperial Japanese armed forces bunker beneath the ministry in Tokyo's Ichigaya district on July 1. Participants given tablets can 'go' into every corner of the bunker. Only one section of the wartime facility is actually open to the public.

The Imperial General Headquarters' Army Section, the Department of the Army General Staff and other military bodies were based on ministry grounds during WWII. The bunker was built for them between August 1941 and December 1942 as a bomb shelter about 15 metres underground. Three parallel corridors were dug north to south, and two corridors cross them east to west.

According to the Defence Ministry, the bunker had been open to the public but was closed about twenty years ago due to deterioration. After quake-resistance and repair work, it was added to the ministry tour route in August 2020, but visitors can only enter some parts of it close to the entrance. The ministry decided to introduce the virtual content to show the entire 48-metre by 52-metre bunker to enhance tour satisfaction.

Using a tablet distributed by the guide, tour participants can see the former army minister's office and communications room up close, though in the real world they can only catch a glimpse of them from a distance. They can also go up and down the stairs that used to connect the bunker with a building above, making the visitors feel as if they were there.

After World War II, the bunker was used by the General Headquarters of the Allied Powers, and English signs on a water tank and the corridor walls can be seen in detail, communicating the great changes that came with the war's end in 1945.

Defence Ministry tours are held in the mornings and afternoon. The bunker is included in the afternoon tours, which costs 700 yen (about £4.60) for adults and is free for those under 18. For details, visit the ministry's website at: www.mod.go.jp/j/publication/ichigaya/index.html (in Japanese).

SOURCE: *The Mainichi* (Japanese daily paper), 1 July 2021

China building underground missile silos

China has begun construction on more than 100 missile silos for intercontinental ballistic missiles in a desert near the northwestern city of Yumen, experts have said. Researchers at the James Martin Center for Nonproliferation Studies in California have obtained commercial satellite images that they say show the construction of the silos underway.

The images show 119 nearly identical construction sites that the analysts say mirror features seen at existing launch facilities for China's arsenal of nuclear-tipped ballistic missiles. China is believed to possess a relatively small stockpile of nuclear weapons (when compared to the U.S. and Russia), of between 250 to 350. Therefore, the new silos could represent a significant up-scale in warheads.

However, China has been known to build decoy silos in the past. Such a tactic was used by the U.S. in the Cold War, moving its ICBMs between silos to ensure the Soviets would never know their exact location.

The construction suggests China is aiming to bolster the credibility of its nuclear deterrent. If the silos under construction at other sites across China are added to the count, the total comes to about 145 silos under construction. The director of the East Asia Nonproliferation Program at the Center for Nonproliferation Studies said, "We believe China is expanding its nuclear forces in part to maintain a deterrent that can survive a U.S. first strike in sufficient numbers to defeat U.S. missile defenses."

The silos are likely intended to hold the Chinese ICBM known as the DF-41, which can carry multiple warheads as far as 9,300 miles. This potentially puts the U.S. mainland in its reach. The apparent silo construction sites spotted in the satellite images are grouped in two huge swathes, covering parts of a desert basin west and southwest of Yumen.

Each site is separated from its neighbours by about two miles, with many of the construction sites concealed by large, dome-like coverings. This is a practice that is also carried out at other known sites for missile silos in other parts of China. Satellite images from the sites with no cover show construction crews and a characteristically circular-shaped hole being excavated in the desert floor.

SOURCE: *MailOnline,* 2 July 2021

Holiday let plan for WWII bunker in Ringstead, Dorset

A windowless WWII bunker is to be brought back into use as a holiday let with sea views. The Grade II listed bunker at Ringstead in Dorset was once part of the RAF Ringstead radar station. The concrete structure, which is almost invisible from the outside, will be turned into two-bedroom accommodation.

Planning consultants describe it as a unique opportunity to restore the bunker so others could appreciate and celebrate its wartime history. The designs include the creation of a glazed opening to let in light and reveal coastal views.

RAF Ringstead was built in 1941 on the coast east of Weymouth to provide early warning of German aerial attacks, playing a crucial role in the air defence of the country during the Battle of Britain and changing the course of the war. It later served as Rotor station site 'SRD', and from 1963–74 as a USAF Troposcatter station.

Chain Home was a ring of early warning radar stations built around the coastline as part of WWII defences. The site includes two transmitter blocks, two receiver blocks, the bases of two receiver towers, a substation and a Standby Set House. They are dispersed over an area of some 26ha.

Dorset Council had agreed the plans more than a year after the initial application, during which time the structure was listed in 2020 and the designs amended. A report to councillors said the scheme ensured the future-proofing of the heritage asset whilst providing benefits to the rural economy from the holiday accommodation income.

SOURCE: *BBC News Dorset,* 22 July 2021

Irish army find tunnel at Fort Davis, Cork

The Irish army – which runs Fort Davis near Whitegate – has uncovered a 100m-long tunnel, part of a network beneath the complex at the mouth of Cork Harbour. On clearing scrubland, they also discovered old ruins and pillboxes along with the remains of torpedo bays in the hewn-out rock at the bottom of the three-level structure, the majority of which is underground.

Commandant Pat O'Connor, who is in charge of the fort, believes that it is an archaeological goldmine as throughout a long history, the site remained relatively undisturbed as it had always been occupied by military forces.

The fort was developed in stages from 1607 when it was called King John's Fort. It was built to repel foreign fleets from entering the harbour as had occurred a few years previously when Spain landed troops to help the Irish, leading to the Battle of Kinsale. At that time, the fort was built as a hilltop installation.

Sea level entrance to Fort Davis. Fort Carlisle was its previous name. Photo Nick Catford

Like other fortifications around Cork Harbour, it was used by the British as a high-powered defensive system to protect one of the most strategic ports of the then British empire. The fort was extended over the years with a myriad of underground tunnels which were dug out of rock, primarily by French prisoners captured by the British during the wars of 1798–1815.

It had been garrisoned previously during the Jacobite Wars (1688–1691) and was updated again during the American War of Independence (1775–1783), when it was renamed Fort Carlisle. Sgt Paul Fitzgerald, whose team from 1st Cavalry Squadron are in charge of maintaining the training facility, said it took three weeks to clear the 100m-long tunnel.

During the fort's heyday in the 1860s, there were twenty big guns guarding the mouth of the harbour. One was a Moncrieff "disappearing gun" which became retractable by the use of a five-tonne counterweight – one of only four examples of the gun in use throughout the world for coastal defences.

SOURCE: *Irish Examiner*, June 2021

Nottingham RGHQ goes on the market

A bunker designed to maintain government in the event of nuclear war is about to go on sale. The three-storey structure, known in the Beechdale area of Nottingham as the "Kremlin", was built during the early 1950s to the standard design, consisting of two levels, one below ground and one above, with the main control room spanning both levels.

The network of thirteen Regional War Rooms was quickly redundant being replaced in the early 1960s by Regional Seats of Government (RSG). Most of the war rooms did not fit into this scheme and were put to other uses. Three however were retained and enlarged; those at Kirknewton and Cambridge were extended by adding another larger block at one end of the building.

That at Nottingham was enlarged in a bizarre manner as there was insufficient land available on the tightly packed government estate for a large extension. A three-level extension was built on one end with two short storeys (the lower slightly sunken below ground) butting on to the southern end of the war room and a longer third storey across the top of the new extension and the existing war room.

This floor was cantilevered, jutting out at one end and the two sides. This overlapping floor is supported along the sides on concrete stilts and the two side stairwells and at the northern end by an emergency staircase from the top floor directly down to ground level.

The building was redesignated RSG3 and remained in use until 1965 when the RSG network was abolished. It was probably used as an SRHQ until 1969. Since 1969 it has been used by MAFF (now DEFRA), in part, for furniture storage although most of the rooms remained empty and unused.

A government spokesman said potential future uses included music or film production or even indoor farming. The building also comes with two hectares (five acres) of land and currently only expressions of interest are invited.

SOURCE: *BBC News, Nottingham,* 14 May 2021 and Sub Brit website

Hope Cove ROTOR bunker and RGHQ sold at last

One of the finest examples of a Cold War nuclear bunker has been sold after being put on the market for £435,000. The Grade II listed structure, near Kingsbridge in Devon, was re-advertised for sale after failing to meet its asking

price at an auction in February 2021. But now it has been snapped up although the purchaser's details are undisclosed.

Located in a commanding position, high above the Salcombe estuary, the building is considered one of the finest examples in existence of a post-Second World War bunker.

Hope Cove was a World War II radar station. In the early 1950s it was revamped as part of the RAF's ROTOR air defence scheme. It was one of five stations equipped with a type R6 (semi-sunk) bunker. The others were Hack Green, Langtoft, St Twynells and Treleaver.

In the late 1950s the site was taken over by the Home Office and the R6 bunker was turned into a Regional Seat of Government (RSG). Later it became in turn a Sub-Regional Control (SRC), Sub-Regional Headquarters (SRHQ) and Regional Government Headquarters (RGHQ) under various Home Office schemes.

Photo Nick Catford

Reports that the bunker was totally refurbished in the 1970s and that it is almost identical to Hack Green are untrue. Apart from relatively minor improvements to electrical wiring and communications, most of the facilities date back to the Rotor era. The building still has its original air-conditioning plant, and most of the teak false floors are still in place. This site is also known as Bolt Head and, as an RSG, was codenamed Gull Perch.

Although details of who has bought the building, or what it could be used for, have yet to be revealed, it was previously reported that there had been interest in turning it into a wine store, or for other storage, or even if it could be turned into housing.

SOURCE: *Business Live,* 6 May 2021 and Sub Brit website

NEWS – MISCELLANEOUS

Large basements blamed for flash floods in London

X-Factor boss Simon Cowell's £15million mansion was hit by flash flooding that caused millions of pounds of damage to properties and was today blamed on sprawling super-basements.

The 61-year-old TV and music star was spotted near his West London home as families and businesses dealt with the waters which had cascaded into homes, ruining treasured possessions and mementos and causing expensive damage. Mr Cowell seemed in reasonably good spirits despite hinting his home may have suffered from the floods. Asked whether he had escaped the flooding, he admitted, "not really, my house nearly floated away."

Sprawling super-basements dug beneath London's homes have now been blamed for the flooding. The enormous underground caverns – popular with the wealthy wanting to expand their space – were criticised by experts and victims of the massive leaks as they counted the cost of wet weather in July.

Kensington and Chiswick were particularly hard hit as three inches of rain made it the third wettest day for West London on record. On 12 July flood waters also poured through the streets of Portobello Road in Notting Hill after nearly three inches of rain hit the capital in just 90 minutes.

In Raynes Park, south London, cars were left abandoned in around 2ft of water after torrential downpours caused travel chaos and left homes and businesses flooded. Meanwhile in Turnpike Lane, north London, people were spotted wading through the water in the streets as the heavy rain pelted down and flooded the roads.

Ed Barry's office in Ladbroke Grove submerged in water after flash flood. Photo Ed Barry

Flooding expert and campaigner Mary Dhonau OBE and former chairman of the National Flood Forum claimed the rise of the 'super-basement' would have contributed. She added "Undeveloped grass and land can easily absorb heavy rain if and when it falls, soaking up the water like a sponge. But if it has been removed it means there is nowhere for the liquid to go, causing flooding.

"When there is rain it falls onto the ground and percolates in areas of the ground. Super-basements are being built where the water would naturally percolate. There are other factors like climate change, but the more we take away permeable surfaces the more places will flood."

Queen guitarist Brian May, who also lives in the area, said he was heartbroken and devastated after coming

back to the 'horror' of finding his basement flooded with a sewage overflow which destroyed carpets, rugs and precious photos and memorabilia from over the years.

Historically, for 150 years, Kensington has never flooded due to rainwater. The Royal Borough of Kensington and Chelsea council was warned years ago that sinking so many deep basement extensions would obstruct the aquifers underneath our living space and render the drainage system ineffective.

SOURCE: *MailOnline,* 13 July 2021

Police looking into huge hole dug in Bexhill, Sussex, wood

The large hole was discovered in the woods at Levetts Field, Bexhill, on 13 April. It was found after concerns were raised about a group of people digging holes.

A spokesman for the police said officers identified those responsible for it and gave them words of advice. Rother Police said three holes had been dug in the area, with the one pictured measuring a depth of six feet.

SOURCE: *Hastings and St Leonards Observer,* 13 April 2021

Teenager spends six years digging underground home in garden after fight with parents

When Andres Canto was a 14-year-old, he got into a minor argument with his parents when they told him he couldn't go into the local village wearing a tracksuit. In retaliation, he stayed at home and grabbed his grandfather's pickaxe, using it to take out his frustration by angrily attacking the ground in the garden.

But Andres' act of petulance bizarrely became an obsession, and six years after the now 20-year-old first broke ground, he has created his very own underground cave, with steps leading deep down to a structure comprising a living room and bedroom.

Andres, who is now an actor, says he has no idea what initially sparked the idea of using his frustration to dig a hole at his family home in the town of La Romana, Alicante, Spain, but he began using it as a way to wind down in the evenings after school, working on his excavation by hand several days a week.

As he began to create rooms, he reinforced the ceilings using arched entrances and vaulted ceilings with reinforced columns to prevent a potential collapse.

The underground escape even provides a cool place to relax in the summer, with Andres explaining it stays at a constant 20 or 21 degrees even in the hottest months of the year. However, he adds that it does occasionally flood during heavy rain and often attracts insects, spiders and snails.

He says his parents were fine with the build – but that authorities did visit to ensure it was legal, finding no issues as it couldn't be defined as a basement, extension or storage structure. He estimates the project has cost him a grand total of £43. Andres has plans to expand yet further, with the cave currently boasting two rooms, a heating system, Wi-Fi provided by his phone transmitting from the cave entrance, and a music system.

SOURCE: *Daily Mirror,* 1 June 2001

Underground Berkshire

There's just something mysterious and captivating about the notion of secret tunnels. Instantly, your imagination goes wild and you're left wondering – where does it lead? What was it for? And who?

There are many such passageways beneath the streets of Berkshire, each with its own fascinating story to tell, from dandy highwaymen escaping the law to those that can fit entire armies down, should they need to jump into action. We know that a short tunnel once stretched from Forbury Gardens to the Reading Abbey ruins, but the passageway, created in 1859, has been closed off to people since 2009 due to safety concerns, but restoration is now underway.

Like many other Wetherspoon pubs, The Old Manor in Bracknell has a long history – in fact, it's one of the oldest buildings in the town. If you visit the Tudor house today, you can still see the priest's hole above the fireplace, where religious men could flee to during times of religious persecution – the door is dated 1682.

But that's not the only 'secret' space at the Old Manor. Wetherspoon says it has a number of hidden passageways beneath it. One bricked-up tunnel is said to have

connected the pub with the Hinds Head Inn – where Dick Turpin reportedly drank. Perhaps it was used as an escape route for highwaymen? Other, now also inaccessible, tunnels are said to lead to other parts of Bracknell.

The short tunnel linking Forbury Gardens to the Reading Abbey ruins

HM Prison Reading closed in 2014, but was in use as a place to hold the region's criminals from 1844. One of the more famous inmates was writer Oscar Wilde, who was imprisoned for 'homosexual offences' from 1895 until 1897.

The Grade II listed building is, of course, filled with plenty of walkways, cells and rooms, but it also has a secret tunnel. According to Historic England, there's a basement beneath 'A' wing where the prison kitchens once were. In a sealed-off area to the west of this was a munitions store for the Berkshire militia, accessible by a (now blocked-off) tunnel that led from outside the prison walls to the room. Later, that space was used as a prison hospital.

There are a number of river culverts in Reading running beneath Caversham Road and Vastern Road. There are even tunnels at Windsor Castle. Today Windsor Castle is a beautiful home, lavishly decorated and surrounded by spectacular grounds, but you have to remember why it was built in the first place. The fortress was built in the 11th century following the Norman invasion by William the Conqueror, and so naturally it has a lot of hidden hidey holes for royalty to hide in should they need to.

Queen Elizabeth II lives in Windsor Castle for much of the year and beneath one of her carpets – in a little unassuming corner office room – lies a secret trapdoor. In the 2011 BBC documentary *The Queen's Palaces*, host Fiona Bruce took viewers into the secret passageway – a huge medieval space that can accommodate a whole army of men. With Windsor being a live fortress, you have to wonder what other secret nooks, crannies, tunnels and passages it has that we're not privy to.

Palladian mansion Park Place was built after Mrs Elizabeth Baker sold land to Lord Archibald Hamilton in 1719. It was sold in 1738 to Frederick, Prince of Wales, though he died in 1751. After that it was bought by General the Honourable Henry Seymour Conway, a British general and statesman.

Around 300m southeast of the house there are several entrances down to a network of (now ruined) 18th-century caves and tunnels, chipped into the chalk. One such tunnel leads 170m south to the Happy Valley hillside, emerging near the top. There stands a now dilapidated grotto, Grade II listed, which has a long vaulted gallery with niches cut for statues and six arches outside facing down to the river. SOURCE: *Berkshire Live,* 9 May 2021

Editor's note: In the next issue of *Subterranea*, Martin Dixon will be looking at underground Windsor including the Castle.

Medieval well found under living room floor

A grandfather who has spent the last decade digging out a 17ft-deep medieval well in his living room floor has found a coin from 1725. Colin Steer discovered the well after he noticed a dip in the floor of the living room in his Victorian home in Plymouth, Devon, while redecorating 34 years ago.

At the time he had three small children running around so his wife Vanessa asked him to cover it back up, but when he retired in 2012 he took it on as a project and started digging. Mr Steer discovered a sword five feet below the soil, leading him to believe it could date back to medieval times, and he said site plans suggest a record of the well in the 1500s.

The hole is currently 17ft deep and there is about another four or five feet that he wants to dig out but there is already 4ft of water at the bottom of the well currently, "so everything that I dig out now will be wet and mucky stuff," he said. The 17ft hole in the couple's living room is currently covered over by a sheet of Perspex and a trapdoor but once the digging is completed Colin wants to extend the well up into the room to create a feature coffee table.

The couple's grandchildren love to look down the hole through the sheet of Perspex and Mr Steer said it was a great talking point with his neighbours.

Colin has tried some of the water that is at the bottom of the well. It was really clear and tasted fine but he is planning to have the water tested for bacteria and if everything comes back clear he is considering bottling it and selling it.

SOURCE: *MailOnline*, 26 June 2021

World's deepest swimming pool opens in Dubai

The world's deepest swimming pool has opened in Dubai, with a depth of 196 ft. *Deep Dive* opened its doors to invited guests in late June, and includes a massive underwater city of abandoned homes and an arcade.

Dubai's newest attraction is at least four times larger than any other pool in the world and superseded Poland's *Deepspot*, measuring 147ft in depth, for the Guinness World Record on June 27. The complex also doubles as an underwater film studio with state-of-the-art lighting and sound systems, and an editing room nearby.

The site boasts 56 cameras dotted around the underwater city and an advanced hyperbaric chamber for emergencies, which is expected to launch by the end of the year. Dubai's newest attraction is billed as a family friendly day out with diving courses for beginners and advanced divers, but there are also tours on offer.

Those who do not fancy a dip in the water can watch from an 80-seat restaurant equipped with large windows and TV screens. High-profile guests including actor Will Smith and Dubai crown prince Sheikh Hamdan bin Mohammed bin Rashid Al Maktoum have already visited the pool.

That incredible swim centre, designed by architect Emanuele Boaretto, is located within the four-star Hotel Terme Millepini. Visitors, enjoying a regular temperature of between 90F to 93F, are able to use the facilities for free diving and scuba diving, with underwater caves for cave diving beginners. There is also a unique suspended underwater tunnel which is entirely transparent, so non-swimmers can experience the pool without getting wet.

SOURCE: *MailOnline,* 9 July 2021

Theme park in Romania is 120 metres underground

There's nothing surprising in taking a turn on a big wheel, a boat ride or a game of billiards, but in Romania you can do all that 120 metres underground, in the Turda salt mine in the heart of Transylvania.

The Turda mine, one of the oldest in the world, has been turned into a theme park. Summer and winter the temperature remains constant at 10°C. There's also minigolf, ping pong and even games for youngsters. All for eight euros per person.

Throughout the mine visitors' footsteps have replaced the sound of pickaxes and boring machines. In galleries and around the mine's underground lake, generations of

miners have been extracting salt since the 17th century. At one time there were over one hundred of them and they dug out a ton and a half of salt every day. Production ceased in 1932 when the price of salt collapsed.

The mine reopened in 1992 when it became a health resort. The salt-laden air was good for asthma and other ailments and allergies. Now up to 700,000 visitors a year come here, making the Turda mine one of the ten top tourist sites in Romania.

SOURCE: SFES newsletter item translation, from report on La Chaîne Info (TV news channel), 6 July 2021

Plumber turns old air-raid shelter into a toilet

A plumber who discovered a secret underground bunker in his garden has transformed it into a £1,000 toilet. Sam, who did not want to disclose his surname, found the bunker two years ago while digging up and levelling out the back garden of his home in Liversedge, West Yorkshire.

He immediately set to work on revamping the shelter into an outside toilet for his self-made man cave in his garden. The bunker now gets a lot of use and is often used by Sam and his friends and family.

Sam explained: "We originally found it in 2019 while I was digging up and levelling out the garden for a new lawn. My spade went straight through the ground into a void and my father-in-law came up to have a look and we discovered the old barrelled roof and stone stairs. My father-in-law suggested we keep digging – I didn't really fancy it but I was so glad I listened to him.

"It took a few days for us to dig it out and carry all the soil and bricks out by hand. I thought it was an old cellar from

an old house that had been knocked down but I've had people contacting me to say it looks like an old bunker.

"I'm a plumber so it made sense to make the most of the space and turn it into a toilet. I've got a nice, big garden and a man cave bar so it's good for entertaining and this way, my friends don't have to use the house! I built it using most of the materials we dug out so in total, it only cost around £1,000 to build but it was well worth it."

SOURCE: *MailOnline,* 19 July 2021

Abandoned spiral escalator on the London Underground

A new TV documentary, aired in July on the *Yesterday* channel, tells the story of an abandoned experimental spiral escalator built in a lift shaft at Holloway Road station that was thought to be lost forever.

The spiral escalator's inventor, Jesse Reno, was nearly bankrupted by the failure of his project. The American had unveiled the world's first 'inclined' escalator – the kind we know today – in 1896. Reno's ambitious design at Holloway Road was made up of a double spiral which would have allowed passengers to go up and down at the same time. The two spirals were installed around a central core. The outer spiral was for going upwards, whilst the inner one was intended to take passengers down to platforms.

Workers are seen next to the escalator shortly after it was built

The surviving section of the escalator now held at the London Transport Museum's depot in Acton, West London

Like a ski lift, it ran continuously at a speed of around 100 feet a minute. The journey from the base of the lift shaft to street level took an estimated 45 seconds. It is believed to have handrails on both sides. Reno had financed the project himself and so when it failed, he ended up in severe financial difficulty.

The spiral escalator was dismantled in 1911 and was believed to have been lost until its rusting remains were found at the bottom of the Holloway lift shaft in 1988. It was not until 1993 that the parts were recovered by the London Transport Museum. Experts then restored a large section of it and it is now at the museum's Acton depot. Five years after Reno's failed attempt, the London Underground's first escalators were installed at Earl's Court station.

Although the documentary was aired in July it will come round again; watch out for repeats on the *Yesterday* channel.

SOURCE: *MailOnline,* 19 July 2021

NEWS – MINES AND MINING

Lost slate mining village bids for World Heritage status

A long lost village on rugged hilltops in the heart of Snowdonia – which have been compared to Peru's Machu Picchu – could be set to receive World Heritage Site status. Now all that remains of the once-thriving industrial village are shells of workers' cottages, iron tram lines, mills and engine houses which litter the hillsides around Blaenau Ffestiniog.

Images of the ruined buildings partially collapsed over time have been compared to the infamous Inca citadel in Peru. Machu Picchu, which dates back to the 15th century, was given World Heritage status in 1983 meaning it has cultural, historical or scientific value 'considered to be of outstanding value to humanity'. Other sites on the list include the Taj Mahal, Stonehenge, the Great Wall of China and the Acropolis.

Photo F Lilley

The historic slate mines and stone houses were built for workers cutting slate out of the rugged hills and valleys in northwestern Wales. More than 17,000 men worked in the Snowdonia mines at the turn of the 20th century but the industry fell into decline following industrial disputes and the breakout of war.

Gwynedd Council chiefs have submitted a bid for the slate mines to join Machu Picchu as a UNESCO World Heritage Site and a decision was due to be made in late July. The bid includes 20 slate quarries, plus three granite mines and a zinc operation surrounding the town of Blaenau Ffestiniog.

SOURCE: *MailOnline,* 15 July 2021

Kent mining museum due to open in 2022

A museum dedicated to Kent's mining heritage can now be completed after money troubles and then Coronavirus led to delays. The Kent Mining Museum was due to open in March 2019 at a country park in Deal built on one of the county's former collieries. Now, thanks to a £1.2m grant from the National Lottery Heritage Fund (HLF), the project's wheels are about to start turning again at Betteshanger Park.

The Kent Mining Heritage Foundation is at the helm and has revealed there will be a new mining-themed play area and arts-focused heritage trail across the 250-acre park which was built on the site of the old spoil tip.

The museum will be based at the park's new visitor centre building, still awaiting completion, and will tell the story of coal in Kent. From its hopeful beginnings of how the fuel source was discovered in the county, it will retell the story of the mass migration of miners and the unique communities they created; the impact of coal mining; the struggles of miners and the industry's demise.

The collection includes photographic records, oral and written personal stories and memories, formal records and documents, small and large-scale artefacts. Alongside the museum there will be an education programme providing schools visits with a wide range of interesting topics in line with the curriculum. Work on the museum originally began while under the ownership of Hadlow College as part of the wider £40m Betteshanger Sustainable Parks development, but work was suspended when the college went into financial administration in February 2019.

Betteshanger colliery shortly after closure. Photo Nick Catford

The park is now owned by Betteshanger Country Park Ltd, after it was bought in December 2019 by Betteshanger Property Ltd, a joint venture between Quinn Estates and Land Cap, with the intention to support and enhance the country park into the future. Building work for the project will recommence soon with an expected opening in Spring 2022.

The new bid was secured in addition to £500,000 already spent on the build from a previous HLF award granted to previous site owners Hadlow College in 2016. This totals £1.7 in funding from HLF.

Betteshanger Country Park is open daily from 8am to 5.30pm, and visitors can enjoy a wide range of activities tailored to all ages, including cycle hire available including child carrying attachments – walking and running trails, archery, geocaching, exploration of nature and wildlife, and fossil hunting. For more information, please visit www.betteshanger-park.co.uk

SOURCE: *KentOnline,* 30 April 2021

Eden Project plan to save Portland's 'cathedral' mine

Cornwall's Eden Project wants to turn Dorset's hollow hillside into an "internationally famous" attraction that tells the story of life on earth. But the ambitious project is yet to secure the £30m backing it needs. Eden co-founder Sir Tim Smit said Eden Portland would be "a hugely successful, world-class destination that is both a visitor destination as well as a scientific institution."

Eden Cornwall is hoping to secure the £30m through funds from government and philanthropists as well as investing its own money which is hoped would be paid back through ticket sales. Above ground, the natural beauty of the Jurassic Coast stretches as far as the eye can see but, out of the sun, the artificially-lit tunnels of Bowers Mine resemble a deserted underground city, criss-crossed with roads and flanked with towering slabs of limestone.

The stone, formed 145 million years ago, has been used by stonemasons since at least Roman times and can be found on thousands of buildings across the UK and around the world, from the Tower of London and St Paul's Cathedral in London to the United Nations Headquarters in New York.

Bowers is one of a number of quarries on Portland and has been in operation since the 1700s. It is now operated by Albion Stone, which turned it into a mine in 2002. Previous plans for the site have included a dinosaur museum and a "mass extinction monitoring observatory" (MEMO) but they were scrapped due to a lack of funding. Now the Eden Project, which is seeking to build a "network of new destinations", has joined forces with MEMO to create a new subterranean attraction – Eden Portland.

The £30m plan is to turn the caverns into an underground cathedral where the ancient art of stone carving and the

frontier technologies will breathe life into stories of biodiversity, extinction and evolution.

SOURCE: *BBC News* Dorset, 23 June 2021

Application for a new coal mine in Whitehaven, Cumbria

Woodhouse colliery also known as Whitehaven coal mine is a proposed coal mine in Whitehaven, Cumbria. It would be the first new deep coal mine in the United Kingdom in 30 years. The mine is proposed by West Cumbria Mining and plans to extract coking coal from beneath the Irish Sea for 25 years.

Artist's impression of the new Woodhouse colliery

The plan has been criticised by some MPs, scientists and environmentalists due to the coal mine's environmental impact, compromising the UK government's legal commitments to reduce carbon emissions. The mine would extract 2.7m tonnes of coking coal per year, which is used in steel-making. Around 85 percent of the coal is planned to be exported, despite no shortage of coking coal globally.

It is estimated that the coal extracted from the mine would emit 8.4 million tonnes of carbon dioxide per year; in 2019 the UK's total carbon emissions were 354 million tonnes. The UK Climate Change Committee chair Lord Deben has stated that "this is greater than the level of annual emissions we have projected from all open UK coal mines to 2050."

Supporters of the mine have claimed that supplying coking coal for steel manufacture in the UK would reduce coal imports. West Cumbria Mining have projected the mine would create 500 jobs and said they would pay into a community fund for ten years. The final decision, expected later this year or early next, will be taken by the Communities Secretary Robert Jenrick.

SOURCE: *BBC News,* 23 July 2021 and Wikipedia

Investors crowd fund Cornish lithium

A mining start-up has raised £6 million in an over-subscribed crowdfunding campaign as it seeks to develop domestic supplies of lithium for electric vehicle batteries. Cornish Lithium is now valued at just over £80 million after the latest fundraising doubled its valuation when it last tapped investors in October 2020.

The company, led by Jeremy Wrathall, a former Investec banker, hopes to use commercially unproven technologies to produce lithium from geothermal waters and from mining in Cornwall.

About £2 million of the new funds were raised through a crowdfunding campaign yesterday on Crowdcube that "went in 15 minutes" as almost all 1,000 investors bought in. The rush to invest came despite Cornish Lithium's admission that it is at an early stage of its business, has no income and any investment in the company is therefore highly speculative.

The search for lithium underway in Cornwall

Cornish Lithium claims to have discovered a globally significant grade of the metal in deep geothermal waters near Redruth. It is testing technologies to extract it and has secured government funding for a pilot plant. It also plans to produce lithium from granite at a disused china clay mine near St Austell, which it believes could yield more than 10,000 tonnes a year of lithium.

Cornwall's ancient metals mining industry is being revived as companies begin to search for lithium carbonate. Estimates from the government-backed Faraday Institution suggest that Britain will need 75,000 tonnes of lithium carbonate a year by 2035 to produce electric vehicle batteries in domestic "gigafactories".

The geothermal lithium and hard rock mining projects are each expected to cost hundreds of millions of pounds to develop, and the additional funding will be used to continue the progress towards Cornish Lithium's goal of creating a battery metals hub for the UK.

The company insisted that this venture will not be a repeat of Sirius Minerals, in which thousands of retail investors suffered heavy losses after it failed to raise the billions of pounds it needed to develop its North Yorkshire fertiliser mine.

SOURCE: *The Times,* 22 June 2021

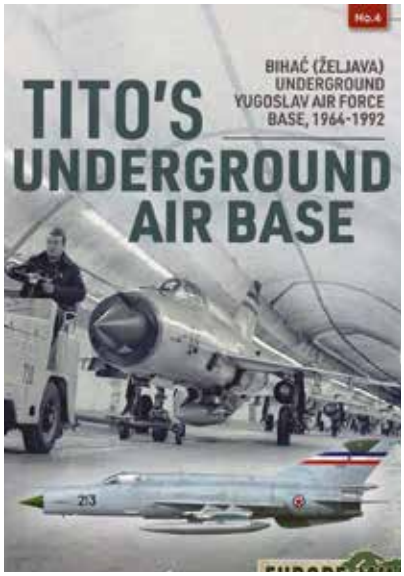
NEWS – PUBLICATIONS

Tito's Underground Air Base

DIMITRIJEVIC, Bojan and MICEVSKI, Milan, 2020, Helion and Company, 64pp,

ISBN 9781-913118-67-9, £16.95

Book Review by Martin Dixon



Many readers will be familiar with the underground aircraft hangars that were built in Sweden from World War II onwards. Indeed, we visited the Cold War example at Säve in 2013 on the splendid Sub Brit Gothenburg weekend. Less well-known (at least to your reviewer) is that similar structures were built in the former Yugoslavia.

This volume describes the largest such hangar which was built at Bihać Air Base (today sometimes incorrectly named Željava after the nearest settlement). It was part of the 200th Air Base of the Yugoslav Air Force and now lies on the border between Croatia and Bosnia and Herzegovina. The underground complex – codenamed Object Klek or Facility 505 – was built into a mountainside to enable the access tunnels to be essentially level. *Klek* translates as 'juniper berry'.

The complex had room for over 60 MiG-21s but also housed maintenance workshops, living and briefing accommodation, magazines, catering, and water and power supplies. It was designed to be self-sufficient behind blast doors for thirty days.

Yugoslavia fell between the two sides of the Iron Curtain and was held together by President Tito who was fiercely nationalistic and built up the Yugoslav Air Force to be one of the largest in postwar Europe. The country only lasted about ten years after Tito's death, in 1980, before it imploded into civil war under ethnic divisions that cost over 130,000 lives. The book covers the life of the underground base from 1964 until 1992. It its final days the base was evacuated and the facility was demolished to prevent it being used by the warring factions.

The book is published as part of Helion's *Europe at War* series – which somewhat confusingly focuses exclusively on the Cold War period. It is a softback A4 format and richly illustrated, showing the base over all of its lifetime. Most of the images are black and white but there are also a few colour photos. There are also some well-drawn maps, aerial photos and plans that help show the underground complex and its relationship with surface features which were predominantly taxiways and runways.

Many official documents have been used in the production of the text. The authors also interviewed a selection of airmen and officers who served at the site, including the last base commander of the 200th Air Base of the Yugoslav Air Force, Colonel Milan Menicanin.

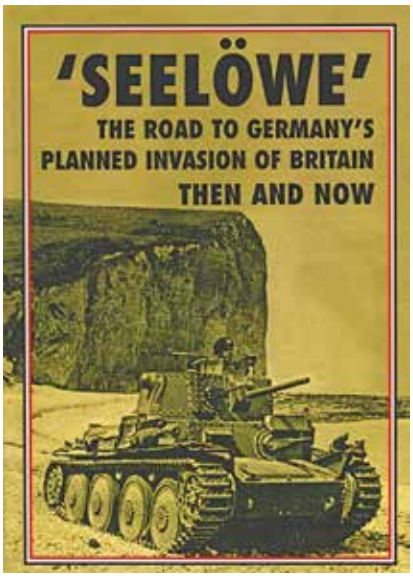
Chapters cover conception and construction, the layout and facilities, day to day operations, the aircraft that utilised the complex and its final days. There is a useful list of abbreviations and bibliography although the latter is understandably almost exclusively to publications in Serbian.

It is unusual to find such detailed accounts on far-flung military structures available in English, particularly ones so well researched and illustrated. There are perhaps more typos than I would have expected; most should have been picked up on proofreading as they are not related to detailed technical terms. The book is relatively expensive for its size at £16.95 but as a niche interest will no doubt have a limited print run and needs to recover production costs.

The authors are Bojan Dimitrijevic and Milan Micevski, both from Belgrade. Dimitrijevic is a historian and ex-custodian of the Yugoslav Aviation Museum and an experienced researcher and author. Micevski has been exploring the archives for three decades and is a leading expert on the former Yugoslav Air Force. Both they and Helion are to be congratulated on their meticulous research and for bringing an unusual and fascinating site to a wider audience.

'Seelöwe' – The Road to Germany's Planned Invasion of Britain, Then and Now

RAMSEY, Winston (Ed), 2021, Battle of Britain International Ltd, 176pp, ISBN 9781-870067-02-7, £29.95.



Book Review by Martin Dixon

Publishers *After the Battle* are renowned for their meticulous treatment of (predominantly) World War II campaigns, battles and events. The house style is precise text with superbly researched photographs of wartime scenes, contrasted with the same locations today. The

images are accompanied by original and insightful commentary.

Most of the output has been in the form of quarterly magazines but they also produce conventional books covering a wider chapter of wartime history. *Seelöwe* is the latest example of the latter and includes material from a number of earlier publications.

The model is stretched to the limit in this volume, devoted as it is to comparing images of an event – Operation *Seelöwe* (Sealion) – that never actually took place. For *Seelöwe* was the planned invasion of Britain by the German Forces.

Despite this apparent anomaly, the book is a delight and approaches the topic by following the timeline from the very outbreak of war up to the point that *Seelöwe* was formally abandoned in October 1940. The decision not to proceed with the invasion was largely a combination of the lack of aerial domination, coupled with Hitler's decision to invade eastwards under Operation *Barbarossa*.

The first events described both predate the proclamation of war and have an underground connection. They concern the covert operation to capture railway tunnels in Mosty in Poland overnight on 25–26 August 1939, thereby preserving a vital communication route. Other underground sites and bunkers abound, including:

* Hitler's headquarters at Felsennest ('Rocky Eyrie') in Germany
* Fort Eben-Emael in Belgium
* Maginot Line forts in France
* Casemate level in Dover and its role in Operation *Dynamo*
* Fromelles World War I bunker in France
* The Admiralty Citadel by Horse Guards' Parade, London
* Pillboxes across southern England

There is good coverage on the battles to achieve aerial and naval dominance, both of which were deemed essential if a German invasion were to succeed. Although the Battle of Britain was vital in Britain achieving the former, the German invasion fleet was largely converted barges rather than bespoke vessels and was thought to be heavily vulnerable to British navy firepower, whose destroyers greatly outnumbered the German fleet.

Just as the Allied D-Day invasion had a deception plan (Operation *Fortitude*), the Germans had Operation *Herbstreise* (Autumn Journey), which would have simulated an attack on Britain's northeast coast between Newcastle and Aberdeen.

As well as conventional photos, there is a wide range of aerial shots including both RAF and Luftwaffe reconnaissance images. The text is also heavily peppered with maps showing the disposition of forces and actual or planned engagements.

There is a comprehensive index although its structure means that some items are not necessarily easy to find (eg Felsennest is only listed under 'Fuhrer's HQs' and airfields, ships and operations are similarly nested).

If the invasion had gone ahead, it would have led to a vastly different set of 'then and now' images; fortunately for all of us, this was not to be.

NEWS – TUNNELS AND TUNNELLING

Chinese subway system flooded

At least 18 people have died after torrential rains inundated towns and cities in central China – trapping people in a flooded subway system in water up to their necks.

Twelve of the deaths reported so far occurred in the city of Zhengzhou, Henan province, after the city's underground network flooded, with horrifying videos showing people trapped in train carriages filling with water while awaiting rescue. Another four were reported dead in the nearby town of Gongyi, while five were injured and another 200,000 displaced in what is believed to be the heaviest rainfall in the region for 1,000 years.

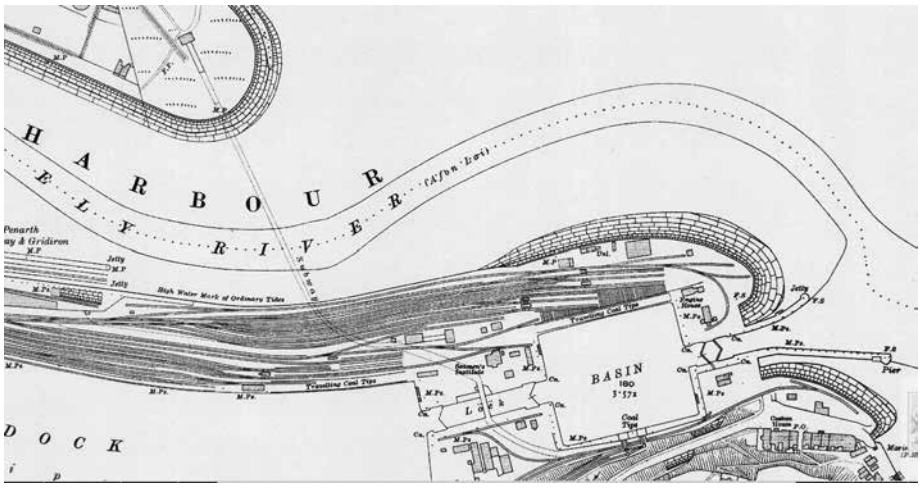
Disaster struck between 4pm and 5pm Tuesday as an incredible 22 inches of rain – seven months' worth – fell on already-saturated ground, triggering flash floods and causing rivers and reservoirs to burst their banks. Train tracks turned to rivers in Zhengzhou as commuters on the city's Line 5 were trapped in flooding carriages then plunged into darkness as the power went out.

Survivors recalled fear gripping them as the waters rose, but said the most terrifying thing was when air inside the trains started to run out. Parents could be seen holding their children up above the floodwaters as it leaked in around the carriage doors, rising above seat level and halfway up their chests.

SOURCE: *MailOnline,* 19 June 2021

Forgotten public subway connecting Cardiff to Penarth

Once among the busiest docks in the world, Cardiff Bay has a long and illustrious history. However, beneath its surface lies the remains of a certain point of history that some may have forgotten.



Beneath the River Ely, you can find a hidden tunnel that has been closed for more than 55 years, one of the many secret tunnels throughout Cardiff. The tunnel, which provided a short cut between Cardiff and Penarth for more than sixty years, meant you could walk right between Penarth Docks and Ferry Road in Grangetown.

Construction of the tunnel began in 1897, starting at Ferry Road, while the final cylindrical section of the tunnel was laid in 1899. It was opened to the public the following year by a Mrs Beasley, wife of the general manager of the Taff Vale Railway Company. The lowest section of the tunnel lies a sizeable eleven feet below the river.

When Cardiff and Penarth docks were thriving, the tunnel was a boon to dockers and others connected to shipping. A toll keeper, who collected a penny from pedestrians, two-pence for a bicycle and four-pence for a pram, was last employed in 1937. Horses are also said to have been allowed through the tunnel.

At the end of one of his last trips through the subway, Gill Thomas was employed by British Transport Docks, 30 September 1963

During the war years, the tunnel was used as an air-raid shelter and for dock operations when Penarth Docks were taken over by the US Navy in the run-up to D-Day. But, following complaints of vandalism, the tunnel was closed in 1963, being bricked at both entrances in Grangetown and Penarth.

SOURCE: *WalesOnline,* 14 June 2019

German workers find tunnel leading to bank vault

Construction workers in Germany appear to have prevented a Hollywood-style burglary after discovering an unfinished underground passage leading to a bank vault.

The unusual find was the result of some routine maintenance work. A Volksbank branch in the small town of Spenge, North Rhine-Westphalia, had hired a crew of labourers to inspect an area of sagging pavement near its entrance. The construction team initially assumed that the issue was due to water damage. But after digging down about two metres, the workers discovered wooden planks, under which was a tunnel, local media reported.

Police were then alerted to the peculiar discovery. Initially, investigators were hesitant to crawl into the tunnel due to the risk of collapse. An inspection was eventually carried out, showing the tunnel to be about eight metres (26 feet) long and one metre wide and supported by wooden planks. The scope of the highly illegal construction project suggests that the culprits had been digging for quite some time.

The underground passage began in a nearby transformer house used by the local power provider, and reportedly extended right up to, or close to, the bank's foundation. The bank's walls had not been breached.

A new lock had been placed on the structure housing the transformer, suggesting that the burglars had broken in and secured it for themselves, likely assuming that the power company rarely checked up on the site.

A spokesperson for Volksbank explained that the burglars would likely have had little success even if they had managed to complete the tunnel. The bank is well-secured against the threat of break-ins, and the branch in Spenge does not keep large cash reserves, he explained. Currently, there doesn't appear to be any suspects in the colourful heist attempt.

SOURCE: *Reuters*, 19 May 2021

Paul Wenning Sowan BSc FRGS FGS FLS, 1940 - 2021

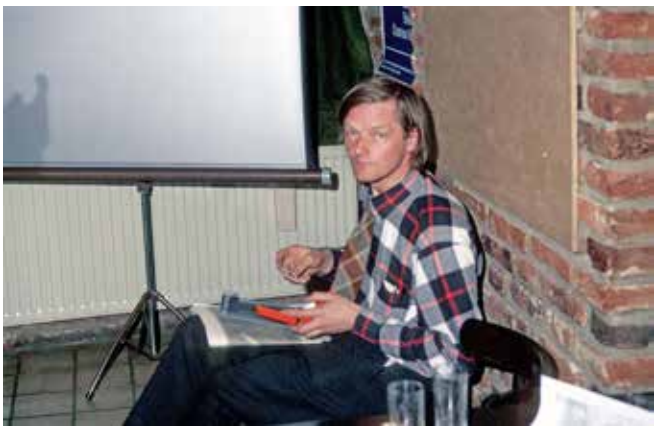
An appreciation by Martin Dixon

Paul emerging from Canterbury Cathedral medieval drain during Sub Brit Kent study weekend June 1984. Photo Phil Marshall

Paul Sowan who died unexpectedly on 4 June 2021 aged 81 was Subterranea Britannica's Chairman for almost 25 years; he oversaw many changes in our interests and activities over this period. His in-depth knowledge, detailed research, wide network of contacts and sociability were all factors that helped Sub Brit succeed. His election to Honorary Member was a clear and deserved recognition of his contribution to our society.

Paul Wenning Sowan was born in north London on 25 April 1940 but moved in 1941 to Croydon – to the same home that he moved back into for the last 15 years of his life. Wenning is an unusual if not unique given name and its derivation is fascinating. The name was given to commemorate the spot where Paul was conceived, on the banks of the River Wenning in northeast Lancashire. Quite a fitting location, as the Wenning Valley has a small coalfield and a number of (now) disused mines.

Paul's father Frederick worked in publishing which no doubt was instrumental in catalysing Paul's lifelong passion for books. One of Paul's first memories was sleeping in a Morrison Shelter; he also had vivid recollections of the V2 impact on Croham Valley Road – 100 yards or so from the family's house – on 29 December 1944 that killed three people. The latter experience meant he had a particular interest in viewing V2 infrastructure in northern France during Sub Brit visits. Paul also recalled being given jam doughnuts from the local army kitchen by troops who had taken over the neighbouring school.



Paul organising slides for his presentation at the Maastricht Symposium in The Netherlands in August 1986

Paul established an early interest in both science and underground matters. He converted his bedroom into

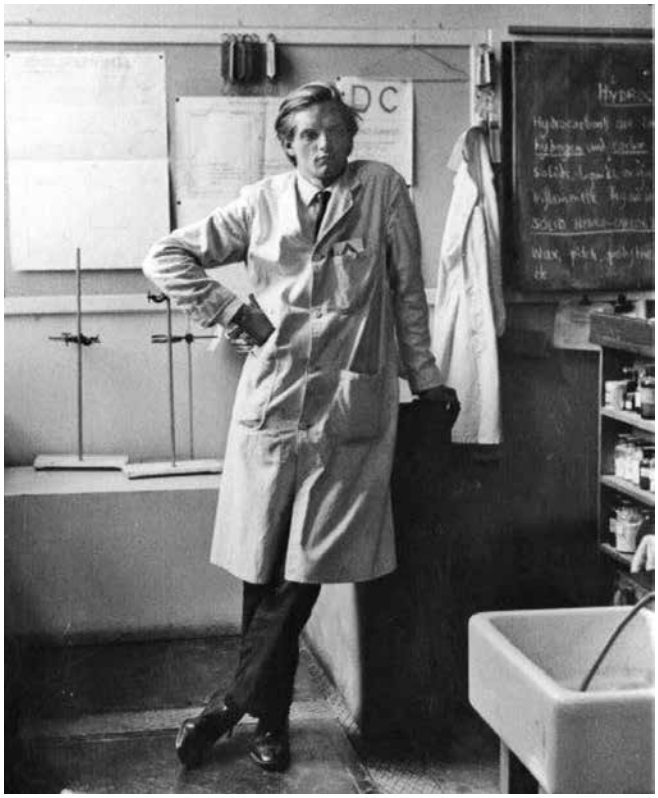
a chemistry laboratory and even the cat he had as a childhood pet was named *Bunsen*. He once dug up his mother's vegetable patch in order to be able to watch the seeds germinate!

Paul failed A-level maths; he claimed it was the best thing he ever did as it led him to take a degree in geology and chemistry at Chelsea College. He visited Iceland on a field trip and fell in love with the country – he was to visit a further sixteen times over the years.

Aged just 20 he joined the Croydon Natural History and Scientific Society (CNHSS) in which he remained active for 60 years. Over the years he served the CNHSS in a variety of roles, including Company Secretary, Director, President (twice) and Honorary Librarian and Archivist. Paul always felt that Croydon's history was as rich as that of Canterbury or Caernarfon.

From an initial focus on geology, Paul's interests expanded and he became hooked on the industrial archaeology of Surrey. Having graduated from London University, Paul became a schoolmaster and taught (mainly chemistry but never sports) initially at Norbury Manor High School for Boys and later at Shirley High School. His long hair (unusual in those days for a teacher) led him to be nicknamed Adam Faith by the pupils. Although vehemently against corporal punishment, he was occasionally obliged to use the cane in line with the school's policy.

Paul was a great raconteur and enjoyed telling of his – often explosive – experiences in the laboratory which these days would probably have resulted in disciplinary action. He was a very popular teacher which was demonstrated by the numerous occasions years later when he would be approached in Croydon pubs by former pupils, usually with the words 'You won't remember me, sir, but I remember you.'



Paul at school in Shirley High School. He was nicknamed Adam Faith (a pop singer of the day) because of his long hair

Paul's interests took a more particular subterranean direction after meeting Brian Hillman in 1966. Brian sought Paul's help in preventing the local council filling in part of the Godstone firestone quarries. The campaign was unsuccessful but it started both a friendship and an increasing focus on underground exploration and research that lasted well over fifty years.

A particular passion was building stone and he maintained that the underground quarries of Box and Chilmark were just as important as buildings like Salisbury Cathedral and the great crescents of Bath that were created from them.

Paul underground in Savonnières-en-Perthois, France in August 1986

A visit to Football Field Quarry, Merstham, Surrey in June 1989

Paul was particularly interested in Reigate Stone, which was extracted from numerous local underground quarries, and he led tours there in conjunction with Wealden Cave and Mine Society. Paul also conducted tours of Reigate Caves until the start of the Coronavirus lockdown.

His expertise in Reigate Stone was recognised and he worked for a while with the Historic Royal Palaces Agency to advise on Reigate Stone preservation and replacement at sites including the Tower of London and Hampton Court Palace.

Subterranea Britannica was formed in 1974 by Sylvia Beamon and Paul joined a year or two later. He was initially our Secretary and became Chairman in the mid-1980s, ably supported by our joint Secretaries Malcolm and Barbara Tadd. In the early days, much of Sub Brit's focus was on domestic structures such as fogous, ice wells and follies. Paul was instrumental in extending our activities to include extractive, transport and military sites.

Paul prepares to address a conference Naples in July 1991

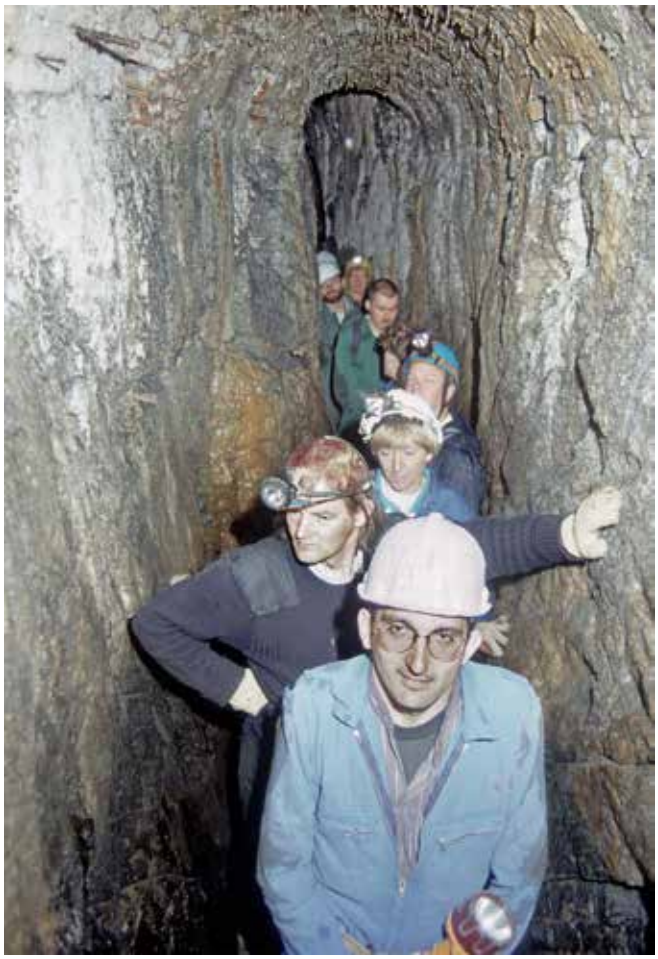
Paul always made copious notes when he went underground. This is Box quarry near Bath in August 1992

When Sub Brit later developed a particular focus on Cold War structures, Paul went along with it but never disguised his dislike of concrete bunkers as opposed to structures in natural bedrock

He was also keen to extend our international links and developed strong relationships – both individually and between similar overseas groups. In particular he made lasting friendships with Joep Orbons and Ton Breuls of SOK (Studiegroep Onderaardse Kalksteengroeven) in the Netherlands. Paul's network of contacts and societies was unrivalled – at its peak he was a member of over one hundred organisations with aligned interests. He travelled to conferences at home and overseas, but almost always by train, with an occasional ferry.

As well as his role as Sub Brit's Chairman, Paul was a frequent contributor to our publications over the years. He compiled news items for many years and his articles were often peppered with references to 'your scribe'. It was a rare occasion indeed when the proofreader had any work to do.

He represented Sub Brit at NAMHO (National Association of Mining History Organisations) and at SERIAC (South East Region Industrial Archaeological Conference). He made frequent presentations, often filling in if a gap in the programme emerged, although his visual aids were often less impressive than his remarkable memory.



Underground in a Prague mine in July 1993

Paul himself was particularly proud to have achieved the designation of Croham Hurst Woods as an SSSI (Site of Special Scientific Interest) in 1984, plus the scheduling of Brockham lime kilns and hearthstone mine in 2004. He also campaigned on other matters, ranging from taking part in CND 'Ban the Bomb' rallies in the 1960s to petitioning against the more recent planned closure of many of Croydon's libraries and archives.

Paul was a life-long vegetarian, indeed his father Frederick was a founder member of the Vegan Society and was at the meeting in 1944 when the word *Vegan* was coined. Paul conveniently overlooked the traditional use of isinglass (derived from fish) as a clearing agent in real ales, of which he was inordinately fond.

Paul's communication, transportation and entertainment ideas lived firmly in the Victorian era. Frequent postcards substituted for email; he loved travelling by train and avoided planes unless absolutely necessary. His radio was permanently tuned to Radio 3 and he never owned a television.

Paul experiencing the nightlife during a Symposium in Liverpool in June 1992

It would be no understatement to say that Paul was a creature of habit. His house was literally packed to the rafters with books; even the treads on the stairs were half-stacked with books so you had to be sure to set off on the correct foot when going up or down the stairs. His filing system was like geological strata with older papers lower down; he'd often try and find papers by searching between the Silurian and Devonian layers for example.

Particularly in the winter, he left home before 0800 most days and often spent his time researching and reading at the Geological Society, British Library or Croydon Archives before a pub lunch. He was rarely to be seen without a red tie, a magnifying glass round his neck and an orange Sainsbury's carrier bag at his side.

In the summer he would move to his 'outdoor office', his wildlife-friendly garden which he was pleased to boast included a small colony of Roman snails. Normally clean-shaven, Paul started cultivating a beard around three years ago; when asked why, he explained quite simply that Sainsbury's had stopped stocking his usual razor...

Paul regularly took visitors into the Surrey stone quarries. He is waiting for people to emerge from the shaft at Bedlams Bank, Merstham in November 1994. Photo Nick Catford

He kept up many friendships with people he had met through Sub Brit, in particular Malcolm and Barbara Tadd with whom he took frequent pub lunches and occasional daytrips across the Home Counties. Paul kept in touch with ex-colleagues and pupils as well as those who shared his particular interests.

He was a regular at the Sub Pub Club – an informal bi-monthly get-together created by Stewart Wild to explore and sample underground watering holes throughout London. He got on well with his neighbours who kept an eye on him during the recent lockdowns when Paul, inevitably, hankered for the pubs to reopen.

After a trip underground it was pub lunch in Betchworth, Surrey in April 2005

Overall, Paul valued friendship and familiarity above fame and fortune. He took a relaxed view on life. If he missed a train then another would be along before long and if not then there would always be a convenient watering hole. Even so, he never travelled without copious reading material. Writing in 2009, Paul professed to be 'very content' with what he had already achieved in life. As ever, a master of understatement.

Generous to the end, Paul donated his body for medical research but this turned out not to be possible. A secular (in line with Paul's beliefs, or lack of them) funeral service was held at Croydon Crematorium on 1 July and a dozen Sub Brit members were able to attend, with many more viewing over the internet. Many fond memories of Paul were shared. Paul himself would have appreciated the irony that after so many years resisting, he was, at last, online!

Paul's younger brother Adam and partner Barbara survive him and we offer them our sympathies.

Photos by Joep Orbons unless stated

Members' Memories

Some of Paul's closest Sub Brit friends recall their own memories of Paul.

Brian Hillman

I got to know Paul very well when I lived in Merstham, not too far from Croydon. Later I moved elsewhere and my house was up for sale. As Paul didn't have his own place

Paul was always a geologist first and he couldn't resist the opportunity to get samples during this visit to Tykarpen limestone mine in Sweden in May 2009

at the time I let him live in the house until it was sold. After almost a year on the market, my Estate Agent got in touch. "It is proving very difficult to sell the property," he said, "when you have a hermit living in it."

Phil Marshall

On one occasion Paul mentioned that for a while he had an interest in a girl whom he met in connection with his involvement with CND. He hastened to add that they did not get much beyond holding hands! Shortly afterwards he went on one of his trips to Iceland. Camped in the middle of those stunning landscapes, he reflected on a future conventional lifestyle in suburbia: a pillar of the community, mowing the lawn on a Sunday, tending the roses, etc, and decided that was not for him. After due consideration, he wrote to let her know he did not wish to pursue the relationship any further.

Joep Orbons

My friendship with Paul goes back to 1985, when I was a young 20-year-old student. It was the starting point of many visits together all over England, Scotland and Wales but also most of the rest of Europe, especially my own country, the Netherlands. He was always such a good teacher to me to keep me thinking and never take things on face value. We wrote letters to each other, a couple of times a year. We kept each other informed about the hustle and bustle of the underground in our area.

Paul liked to tease me. He introduced me to the nooks and crannies of the English language. As an example, I once heard the expression "That instrument is the bees' knees". I didn't know that expression and, pre-Google, I had no way to find out, so I wrote a letter to Paul asking him what the expression means. His answer was as short as it was unexplaining: "The bees' knees means the same as the cat's pyjamas." There I was, having to wait another couple of weeks for our next exchange of letters to get an answer to the tease.

David Ferris

Over the years Paul gradually revealed himself to be a warm and friendly man, extending his slightly shy and unworldly hand as best he could. A man who had enjoyed his career as teacher, who had enjoyed being called Sir, and who had enjoyed inspiring students. He would rarely speak ill of others, more likely to find virtue instead. And who enjoyed spreading the fun of being underground. Like many of us, the thought of not seeing him again brings a tear to my eye, and I'll miss him.

Nick Catford

I remember one trip to France which was just me and Paul. I went by motorbike and met Paul at Calais. I didn't have a spare helmet so suggested he put his mining helmet on and hope we didn't get stopped by the police. We toured round northern France visiting mining sites and German bunkers. On the third day, I glanced in my mirror and noticed Paul was on fire. I quickly pulled over and we both jumped off; it appeared Paul's coat had dangled on the exhaust pipe and caught alight – he hadn't realised what was happening. It was hilarious and fortunately Paul wasn't hurt.

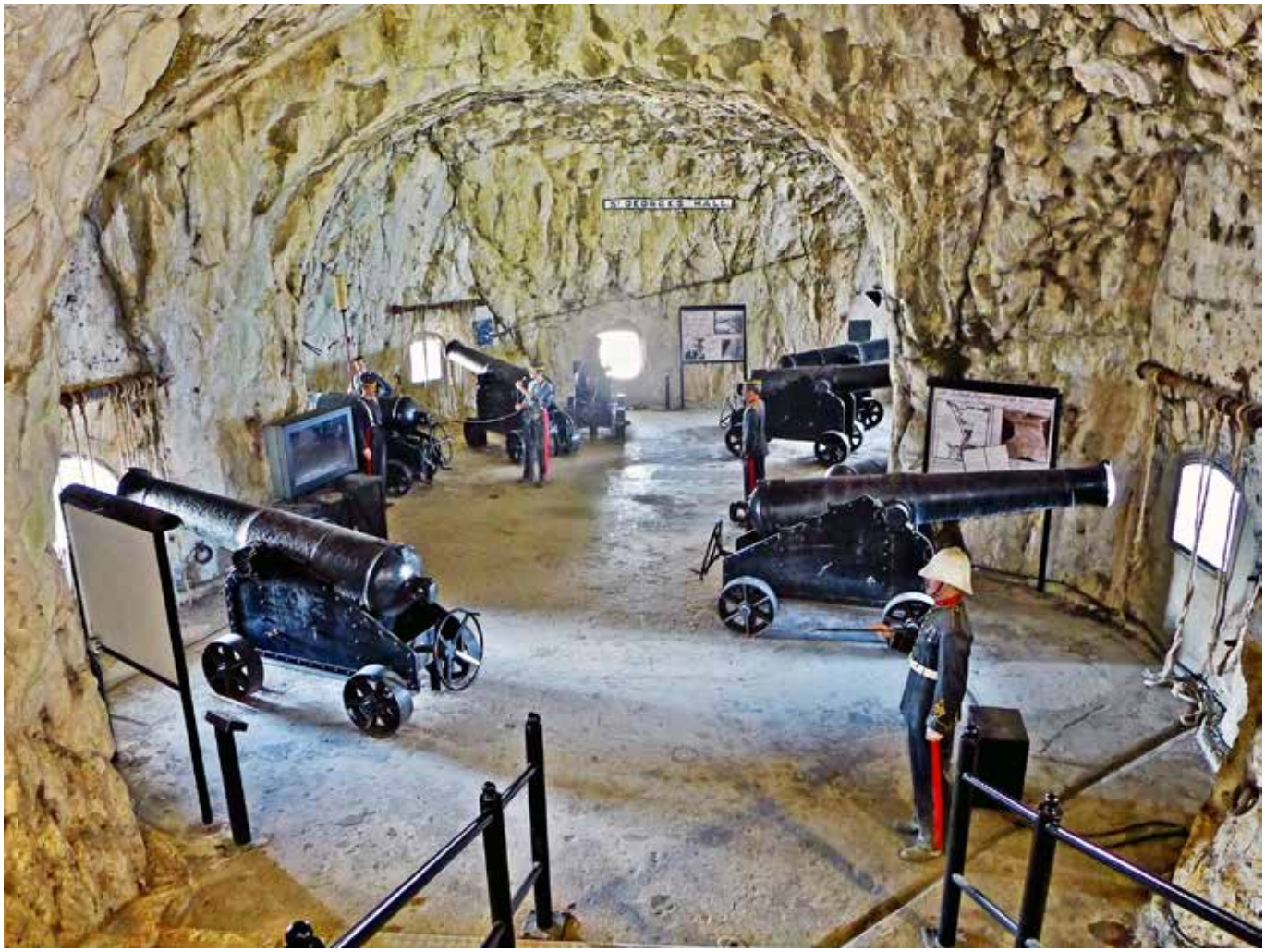
Malcolm Tadd

Paul did not regard the house he inherited as a proper home. He saw his house as more of a bookstore for his thousands of books. Comfortable it was not; for pubs were where he was most comfortable and relaxed. He told me his idea of dying was to expire quietly in the corner of a pub with a glass of beer in his hand.

Photo Clive Penfold

The 18th-century tunnels of Gibraltar

Tim Wellburn



St George's Hall, excavated within 'The Notch' on the North Face of the Rock. This was the post-Great Siege culmination of Sgt Maj Ince's gallery, originally intended to enable a gun to be mounted on top of this outcrop

Introduction

In 1800, Gibraltar was at the zenith of its military invincibility. The heavily-outnumbered British Garrison had resisted every assault by the massed besieging Spanish and French armies and fleets over a period of four years, from 1779–83. Remarkably, however, the greater part of Gibraltar's 18th-century system of tunnels and underground casemates, which greatly strengthened the landward defences, was constructed in the period just *after* the end of the 'Great Siege'.

The geographical relationship of the 18th-century tunnels – referred to as the Lower, Middle and Upper Galleries (all highlighted in yellow: the plain pink ones are World War II vintage). The Lower and Middle Galleries were linked by a contemporary 'Communication' (protected pathway); the Upper Galleries were only physically connected to the others in 1941 when Farringdon Raise was driven up from near the WWII underground nodal point of 'Clapham Junction'

With the exception of the Upper Galleries (including St George's Hall) – which have long been conserved and made accessible to the public as 'The Great Siege Tunnels' – most of the rest of the 18th-century works simply lapsed into decay and popular oblivion once they had been abandoned by the Army. This is now starting to be remedied under a remarkable initiative launched by Deputy Chief Minister

The Notch, viewed from the Great Siege site of Queen Anne's Battery on Willis's Plateau. This battery caused the Spanish such annoyance that they mounted a mining attack on it, hoping to collapse the entire cliff face. High above, atop the North Face, the 'Rock Gun' was successfully mounted on 13 October 1799. The Union Flag flies here to this day. Photo Clive Penfold

Dr Joseph Garcia, and led by Project Director Carl Viagas, which is – literally – digging out the 'Northern Defences' from half a century of neglect.

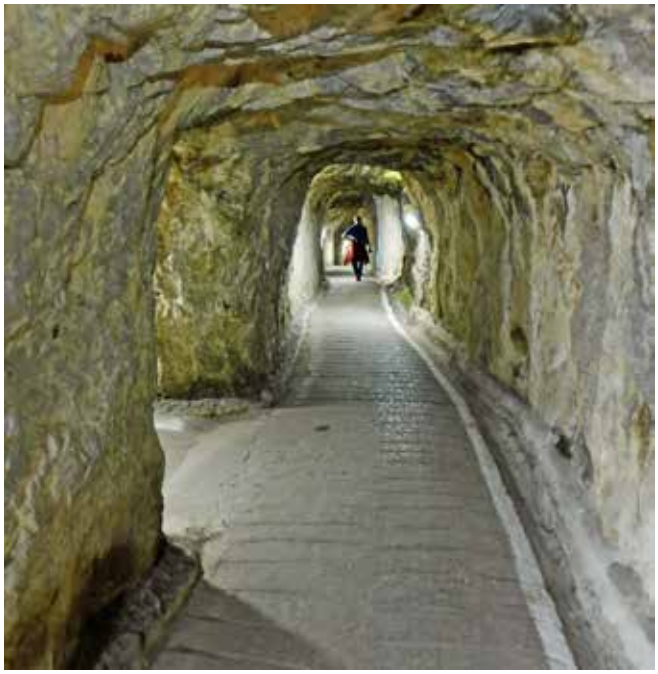
This account[1] will focus on the underground elements of Gibraltar's 18th-century defences, excavated over the course of about a decade, from the first breaking of rock late in the Great Siege.

Sgt Maj Ince's Inspiration: The Upper Galleries

During the Siege, the Spanish constructed a series of saps and batteries extending well forward into the 'Neutral Ground' of the isthmus separating Gibraltar from Spain. The British had established numerous gun positions, including on the heights of the Rock, for counter-battery fire but there remained areas of dead ground which the Spanish exploited. One, theoretical, option was to mount a gun on 'The Notch' – an inaccessible spur on the North Face of the Rock. Sgt Maj Henry Ince, a Military Artificer, proposed driving a tunnel to it.

Work commenced in May 1782. Driving a heading parallel to the rock face involved a certain amount of trial and error. At some point, it was deemed necessary to ventilate the blasting fumes by driving a side opening to fresh air. It was then realised that this provided an early opportunity to mount a gun.

Coupled with Lt Koehler's invention of the ingenious Depressing Carriage, enabling guns to be pointed 70^0 below the horizon, this proved a great success. Although The Notch was not reached before the end of hostilities, several more guns had been mounted to good effect in casemates excavated along the tunnel, subsequently named Windsor Gallery.



Part of Windsor Gallery excavated during the Great Siege and subsequently visited by the Duc de Crillon. One of the casemates piercing the rock face lies to the left

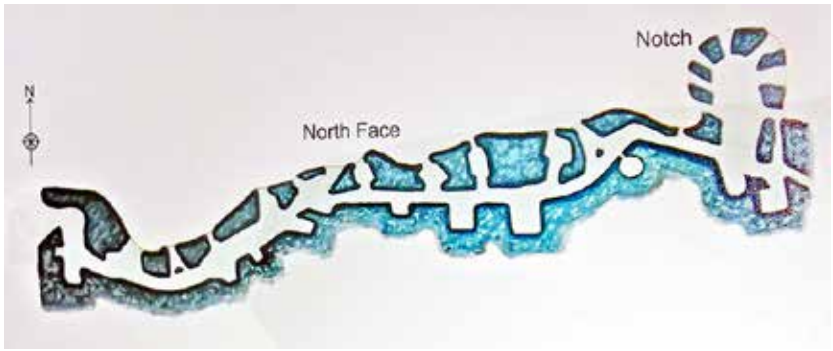
Following the ceasefire at the end of the Siege, in March 1783, the Franco-Spanish Commander, the Duc de Crillon, toured the British defensive works. John Drinkwater, who wrote a contemporary account of the Siege[2], recorded the occasion:

"The Duke afterwards visited the batteries on the heights…when conducted into the gallery above Farringdon's battery, his Grace was particularly astonished, especially when he was informed of its extent, which at that time was between 500 and 600 feet. Turning to his suite, after exploring the extremity, he exclaimed: 'These works are worthy of the Romans'."

Mining continued after the Siege. The cavernous St George's Hall was excavated as a 7-gun battery within The Notch. Cornwallis Chamber, a further subterranean battery, situated at a slightly lower level, was also excavated in this period. Collectively, these works are often referred to as the Upper Galleries.

A tableau within the Great Siege Tunnels demonstrating the application of Lt Koehler's Depressing Gun Carriage within one of the original casemates

The 18th-century works were extended, in 1907–8, beyond St George's Chamber in a long straight easterly heading, named the Holy Land Tunnel, leading out to a position-finding cell and a fire control post, both clinging precipitously to the edge of the cliff.



The full extent of the 18th-century Upper Galleries, including St George's Hall. The small circular chamber to its left is the stairway descending to Cornwallis Chamber

The Northern Defences & Lower Galleries

The Northern Defences are flanking works situated on the steeply rising ground above the narrow approach from the isthmus to Gibraltar's Land Front. They have

The Northern Defences showing their relationship to the town and its Land Front. High above the Lines and Lower Galleries, the row of embrasures piercing the bluffs marks the ascent of the Middle Galleries. Above them are the batteries of Willis's Plateau. The Upper Galleries lie further to the east, higher again. Royal Engineers' Model 1865, Gibraltar National Museum

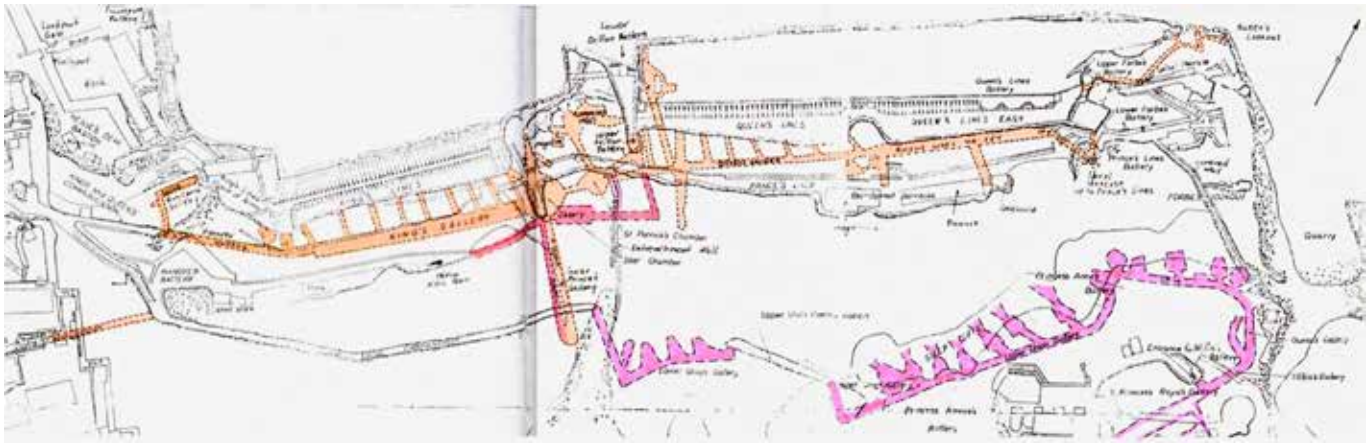
their origins in Spanish or even Moorish times, but were adapted and extended by the British.

By the time of the Great Siege, three sets of 'Lines' (terraces cut into the hillside to form terrepleins) – the King's, Queen's and Prince's – were established, but not their extensive system of supporting galleries, which were constructed only in its aftermath.

The First Gallery of the Northern Defences

Before considering these galleries, it is worth noting that Drinkwater also recorded, on 6 July 1782, during the course of the Siege, the commencement of further tunnelling work within the Lines:

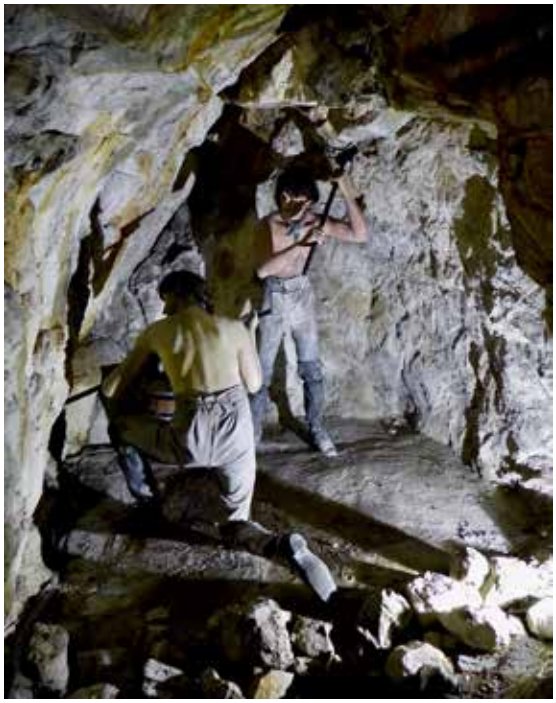
"The success attending our progress in the gallery above Farringdon's battery, produces the idea of making a communication from the extremity of the King's to the Queen's Lines; and, on 6th, a party of miners began this



Part of the Royal Engineers' 1986 Survey Plan showing the Lower & Middle Galleries – the works visible in the RE Model. The Lower Galleries associated with the King's & Queen's Lines are coloured orange, and those with the Prince's Lines red, the latter being some 70 feet higher. Much higher still, coloured purple, are the Middle Galleries (including the detached Lower Union Gallery). Base plan: Wikimedia; HMG – Public Domain

new subterranean passage."

In this case, the objective of the new gallery was not to emplace further guns, but to facilitate the movement of troops to the Queen's Lines due to *"the difficulty at that time attending the reinforcing of the latter, in case of alarm." (Drinkwater)*



18th-century military miners: an exhibit in 'The Great Siege Tunnels'

No gallery or chamber within the Northern Defences bears a date as early as the Great Siege so either some of the marked dates are wrong or the connecting gallery was subsequently reworked during the extensive tunnelling carried out post-Siege.

The portal of Hanover Gallery, viewed from King's & Queen's Communication

Hanover Gallery

Hanover Gallery (1789) is effectively an underground continuation of King's & Queen's Communication, which leads from the Castle Wall to the Lines. An 8ft x 8ft drift, it runs straight ahead towards King's Gallery before which two irregularly-shaped chambers open onto King's Lines Place of Arms and the adjacent King's Lines.

The southern end of Hanover Gallery. Straight ahead is the entrance to King's Gallery; to the left the way into the chamber which opens onto King's Lines Place of Arms

However, before moving ahead to this point, immediately on entering Hanover Gallery, it is worth noting a side passage, running off to the left. This leads to the 1790 Bombproof Battery.

The Bombproof Battery

The Bombproof Battery was designed to enfilade Gibraltar's Landport Gate and Grand Battery. Internally, it comprises a long brick-vaulted casemate, descending gently in a series of broad steps, two of which carry tall, narrow gun embrasures.

The interior of the Bombproof Battery, looking towards the northern entrance. The gun embrasures are the door-like openings to the left-hand side

The battery was originally constructed as a two-level structure, but the lower emplacements were lost as a result of the subsequent construction of King's Lines

Battery immediately in front of it. A chamber off the access passage contains the remains of an internal flight of stone stairs which may have led to the lower level.

Originally armed with two smoothbore guns, it was reactivated in World War II with a 25-pdr – which must have been a tight fit – and in October 1943 received one of the new and very effective 17-pdr anti-tank guns.

King's Gallery

Leading off from the northern end of Hanover Gallery is King's Gallery, which runs behind and parallel to the King's Lines. This takes the form of long rock-cut chambers, approximately 20ft wide, designed to accommodate and/or shelter the troops manning the Lines.

Part of one of the sections of King's Gallery. The angled roof profile reflects the dip of the rock strata

It is not clear whether the gallery was originally cut to these dimensions or only subsequently enlarged. However, an 1860s plan shows it in this form, containing three sets of bunks, each for 36–39 men. Nine short lateral tunnels provided ready access to the terreplein of the King's Lines.

At the northern end of King's Gallery a short passageway leads directly into Star Chamber and thence, via a complex of underground works, to the Queen's Lines beyond.

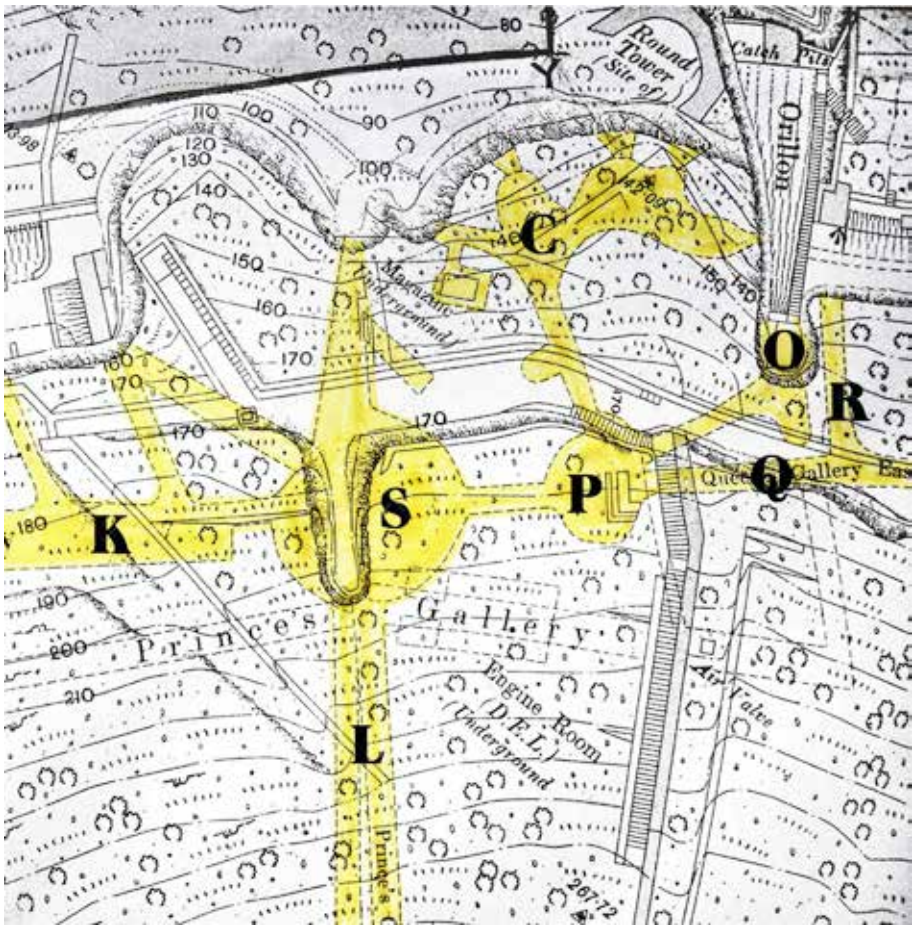
Star Chamber

Star Chamber carries the date 1790. It was excavated out of an existing cave and may have served as the 18th-century miners' base for their tunnelling works. Roughly circular in plan, it acts somewhat as a hub of these galleries, with five passageways opening from it.

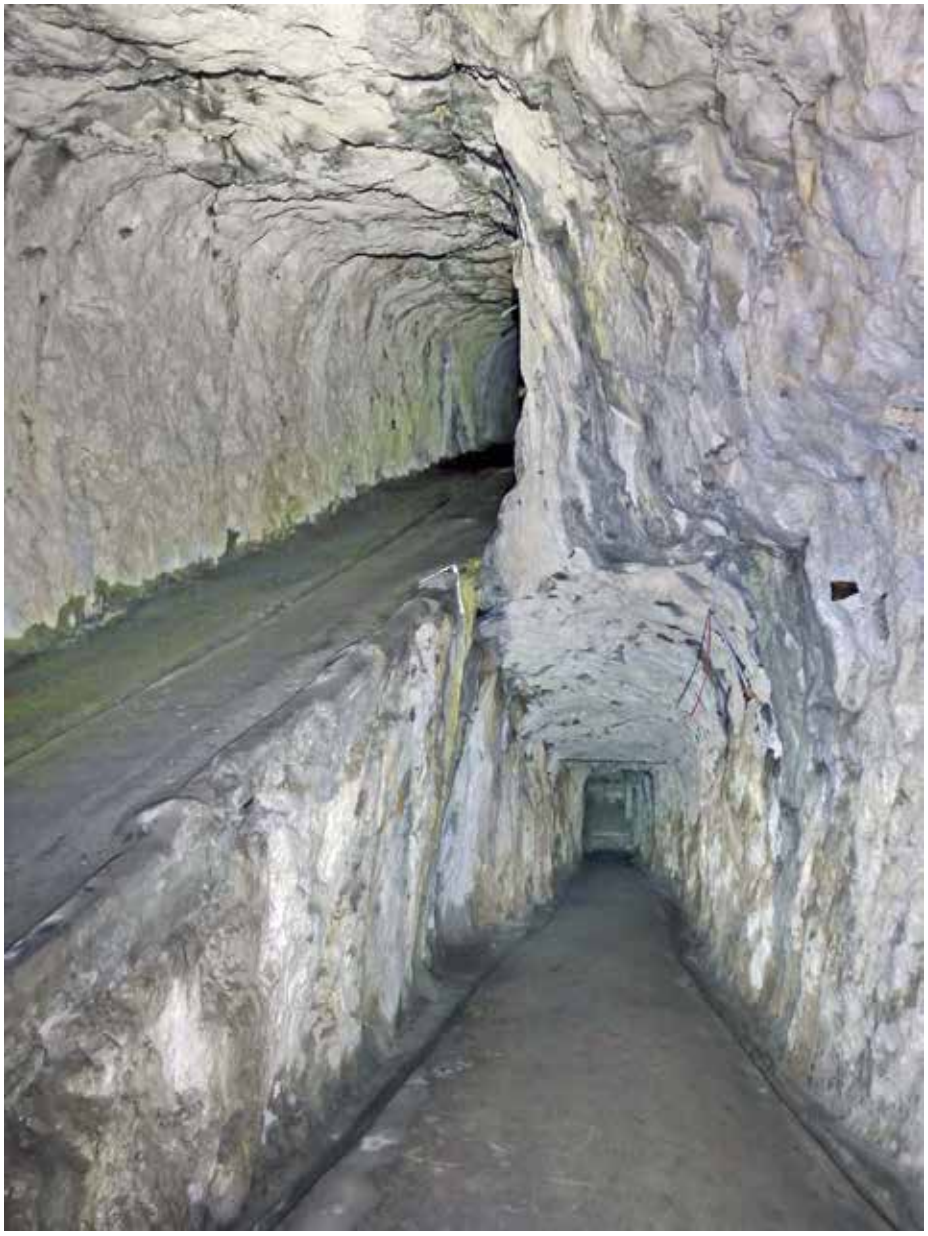
WWII structures within Star Chamber. King's Gallery runs off to the north, continuing beyond the far doorway

In World War II, Star Chamber served as the HQ of the 2nd Battalion, The King's Regiment. This is attested by a fine plaque and evidenced by the range of brick structures which occupy much of the internal space and extend into some of the side passages.

The HQ Plaque of 2nd Bn, The King's Regiment, within Star Chamber



*The Galleries lying between the King's and Queen's Lines: **C** Commons Hall; **K** King's Gallery; **L** Lower Prince's Gallery; **O** Upper Orillon Battery; **P** St.Patrick's Chamber; **Q** Queen's Gallery; **R** Raleigh Gallery; **S** Star Chamber. Base plan TNA: WO 78/4183*



The two inclined planes of the 1790 Lower Prince's Gallery

Lower Prince's Gallery

A remarkable feature accessed from the eastern side of Star Chamber is the 1790 underground Communication named Lower Prince's Gallery. This links the King's and Queen's Lines with the Prince's Lines, higher up the hillside, and appears to have been constructed as a subterranean gun ramp.

The semi-circular chamber at the midpoint of Lower Prince's Gallery where it reverses direction to reach the Prince's Lines

The gallery comprises two inclined planes connected by a 180^0 turn, where a semi-circular chamber has been excavated, presumably to facilitate negotiation of the bend as well as haulage up the first incline; this is likely to have been achieved using block & tackle and muscle power.

The upper entrance, currently closed off by a metal door, emerges at an opening roughly midway along the original line of Prince's Gallery, which links the Prince's Lines back to the Communications at the southern end of the Defences.

St Patrick's Chamber

Across Star Chamber from the passageway leading from King's Gallery, a short linking tunnel to the north opens onto St Patrick's Chamber. This latter is also dated 1790 and circular in plan, although much smaller.

The chamber contains a large iron water tank and a partly demolished musketry wall. The latter once defended this area from Queen's Gallery, which lies immediately beyond, although it would appear to have been somewhat in the way of the defenders of 1940.

St Patrick's Chamber, viewed from Queen's Gallery, showing the partly demolished musketry wall

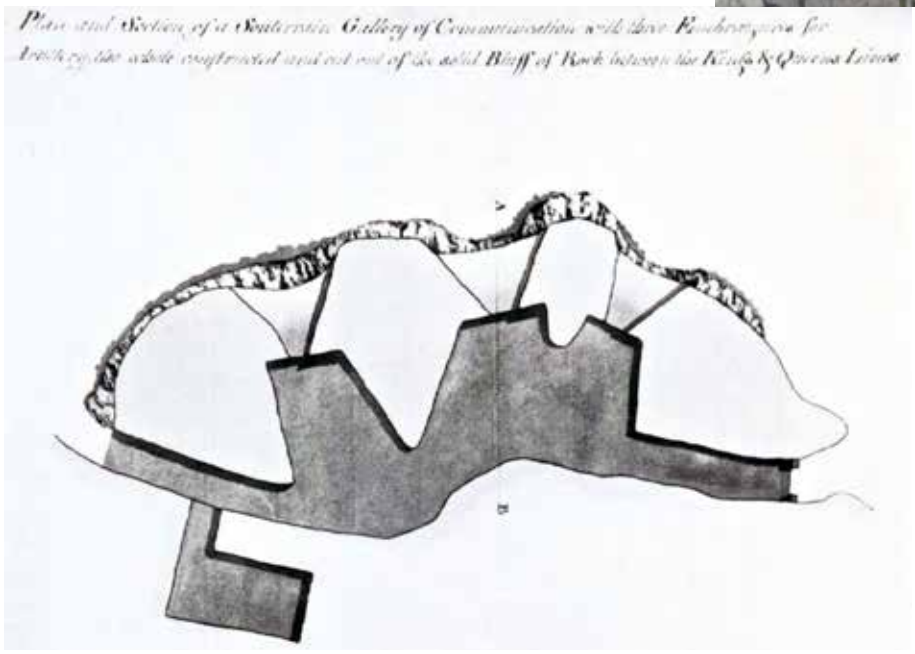
However, St Patrick's Chamber is also an underground crossroads, with two passages leading off to defensive positions excavated within the rock face. These are Commons Hall and Upper Orillon Battery.

Commons Hall

Commons Hall was apparently constructed in 1789, a year before St Patrick's Chamber, so only subsequently was linked back into that and the other galleries. It is a large, irregularly shaped rock-cut gun chamber. It housed a series of heavy guns culminating, in the late 19th century, in two 64-pdr rifled muzzle loaders (RML). These may account for the relatively large embrasures, converted into machine gun positions in World War II. Ranging diagrams are painted next to them on the walls.

Part of Commons Hall showing the northerly pair of embrasures

Two plaques are set in the rock wall next to the most northerly embrasure: one dated 1943 commemorates the 1st Battalion, The Hertfordshire Regiment (whose geography seems to have been a little vague as it refers to St Patrick's Chamber); the other is an earlier crest of which only the relief laurel wreath survives age and vandalism.



A plan of Commons Hall Battery c.1789. Institution of Royal Engineers, Chatham

A contemporary plan of Commons Hall, originally an independent work with only external access, carries the informative title: *Plan and Section of a Souterrain Gallery of Communication with three Embrasures for Artillery, the whole constructed and cut out of the solid Bluff of Rock between the King's and Queen's Lines*.

This is interesting because of the use of the term *Communication*: indeed, the plan clearly shows that it linked two external points on the Lines. It may be that the 1789 battery was enlarged out of a pre-existing communication gallery – namely the one cut in 1782 during the Great Siege, to link the King's and Queen's Lines.

Upper Orillon Battery

The two-level casemate of Upper Orillon Battery, 1788. The embrasures open onto the cleft of the Orillon Fault, enfilading the southern end of the Inundation

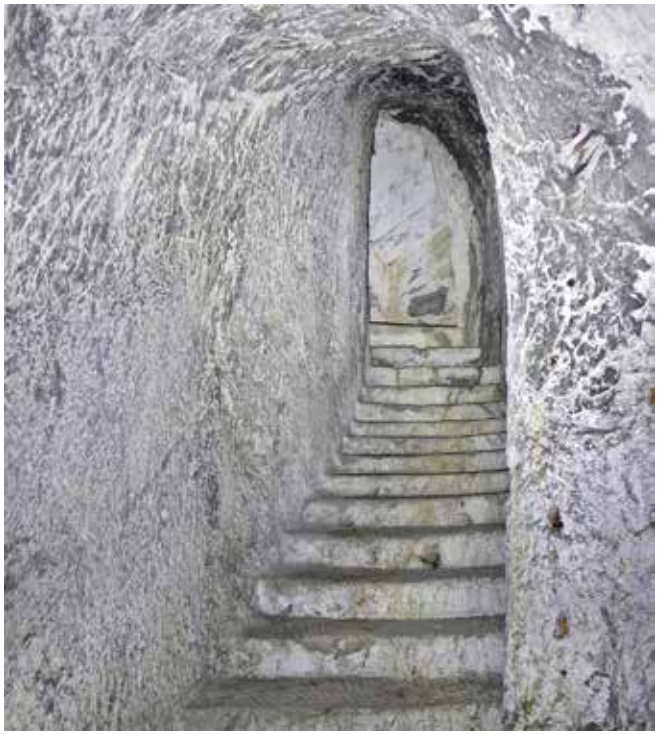
The large chamber of Upper Orillon Battery was excavated in 1788, within the major Orillon Fault, as a two-storey battery. The floor of the second storey has disappeared, although evidence for it is clear. It has a fine brick vault ceiling. In World War II this space was utilised as a bakehouse, but no physical evidence of this now remains.

A Lower Orillon Battery was located further down the Fault. Armament of one 8-inch and two 10-inch howitzers was recorded in 1834, although it is not clear how these pieces were distributed between the Upper and Lower Batteries.

Page's Raise and Lower Orillon Battery

Page's Raise: a 1940 stairway linking into C18 works

Within a short distance of entering Queen's Gallery, the World War II adaptation of these works is further evidenced by a long flight of concrete steps leading down off to the left. Two cement plaques proclaim this to be: PAGE'S RAISE 4th OCT 1940.



An 18th-century stone-cut stairway within Lower Orillon Battery, now leading to a World War II machine-gun position

However, what it leads to is a gun chamber hewn out of the rock, with associated rock-cut steps and passages that are evidently of 18th-century origin. This is Lower Orillon Battery, Page's Raise being excavated to incorporate the position more effectively within the World War II defences.

As well as machine gun positions, there remains a mounting for an anti-tank gun, which accords with the record of Orillon Battery receiving a Hotchkiss 6-pdr in 1940, upgraded to a 17-pdr anti-tank gun in August 1943.

Lower Orillon Battery: one of the 18th-century embrasures adapted in World War II to mount an anti-tank gun

Queen's Gallery

The gallery running behind the Queen's Lines falls into two distinct sections lying either side of a large rock outcrop at roughly their midpoint. On the Royal Engineers' 1968 Plan these are shown, respectively, as Queen's Lines/Queen's Gallery; and Queen's Lines East/ Queen's Lines Gallery, although there is no consistency in naming across different plans or within the galleries.

In plan form, the first section (Queen's Gallery) resembles King's Gallery in that a number of lateral tunnels run out to the Lines, although the gallery itself was cut as a communication rather than as a more spacious troop shelter.

A section of Queen's Gallery, looking south. The entrance to the right was one of the shorter lateral passages to the Lines, now blocked save for a small square 'window'

The gallery cuts across another excavated fault line which contains the remains of World War II brick-built rooms. Nearby, one or more cisterns appear to have been sunk beneath gallery level – substantiated by a painted sign: SMARTS WELL RESERVE.

The portal of the 5th lateral passage between the Queen's Lines and Gallery, one of the few not to have been blocked in World War II

Most of the lateral tunnels have had their entrances blocked up, probably during World War II, but the fifth remains open to the terreplein, its portal bearing the inscribed date 1789 and the numeral 5.

Between Queen's Gallery and Queen's Lines Gallery is a group of excavated chambers and the rubble-choked entrance to another underground Communication, the name of which is indecipherable, but bears the date 1788. This led up to the Prince's Lines but apparently was backfilled during World War II.

The backfilled 1788 Communication between Queen's Lines Gallery and the Prince's Lines

Queen's Lines Gallery

Queen's Lines Gallery is markedly different from the galleries encountered so far. It runs immediately behind the rock face at the back of the terreplein and, for much of its length, appears to have been excavated directly into it and then enclosed with a stout masonry facade.

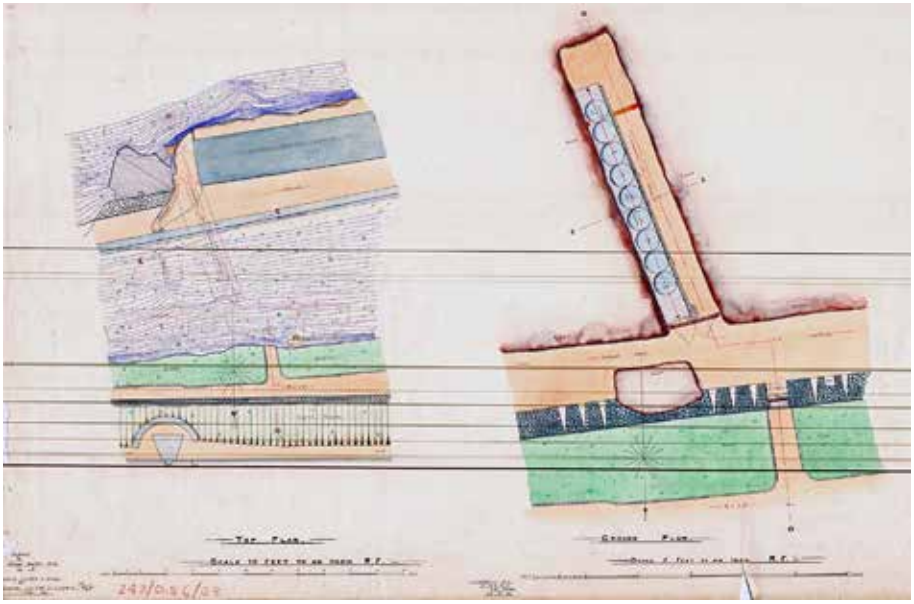
The protected passageway thus created was pierced at regular intervals with embrasures to form a long musket gallery. Only a limited number of entrances were provided from the terreplein. Internally, the gallery is divided into four sections by stone traverses, later supplemented by some substantial World War II concrete walls or pillars.

At about the midpoint of the gallery, running further into the hillside, is a dead-end passageway of substantial dimensions, with a raised plinth running down one side.

Queen's Lines East, with the stone facade of the musket gallery set in the rock face at the back of the terreplein

Queen's Lines Gallery: one of the musketry bays with its stone traverse. The small alcove at floor level is marked on a plan as a fire. The bay beyond has a doorway onto the terreplein and a World War II brick guard house (?). Almost opposite this is the Reserve Oil Store

It carries no date, although it is marked on the 1897 plan. A Royal Engineers' 1908 ground plan, held by the Gibraltar National Archives, identifies it as a reserve fuel store. Its prior function remains a matter for conjecture.



The RE 1908 plan of the Reserve Oil Store then being established within Queen's Lines Gallery. This clearly shows the structure of the 18th-century gallery with its masonry facade. Gibraltar National Archives

Queen's Advance Gallery

An advance gallery dating from 1788 extends from the foot of Lower Forbes' Battery out to the 1789 Queen's Lookout, situated on the corner of the cliff face. This narrow gallery follows a slightly tortuous path. It incorporates a chamber, in the floor of which is a (WW II?) steeply inclined shaft down to a blocked entrance at the foot of the cliff. The Queen's Lookout beyond appears to have been adapted as a machine gun position in World War II.

Prince's Gallery

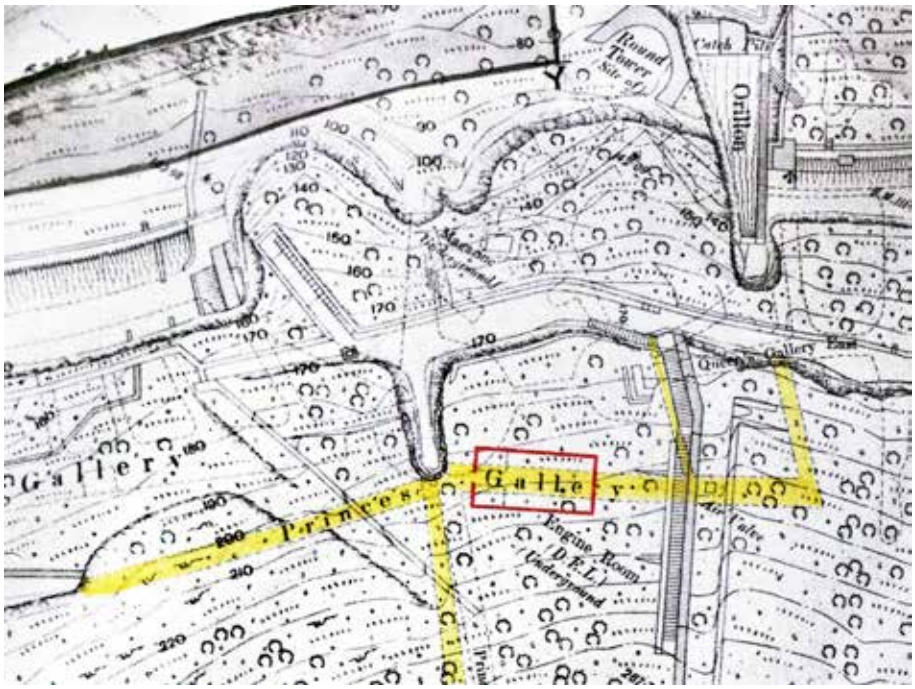
Unlike the other two sets of Lines, the Prince's Lines, which run parallel to the Queen's Lines about 70 ft higher up the hillside, are not backed by a

The spiral staircase leading up to the Prince's Lines from the northern end of Queen's Lines Gallery

Queen's Lookout – adapted as a WWII machine gun position

Beyond the furthest musket position, the gallery kinks east and climbs to the foot of a shaft. This contains a decayed concrete spiral staircase which leads up to the Prince's Lines, emerging in a short tunnel cut through a rock spur near the end of the Lines. The shaft dates from the 18th century, so the original staircase would probably have been wooden – and, in extremis, capable of demolition.

The gallery turns abruptly right (north) here and climbs steeply to emerge at a portal, dated 1788, immediately adjacent to Lower Forbes' Battery, just above the northern end of the Lines.



Prince's Gallery with its original entrances and connections to the Lines

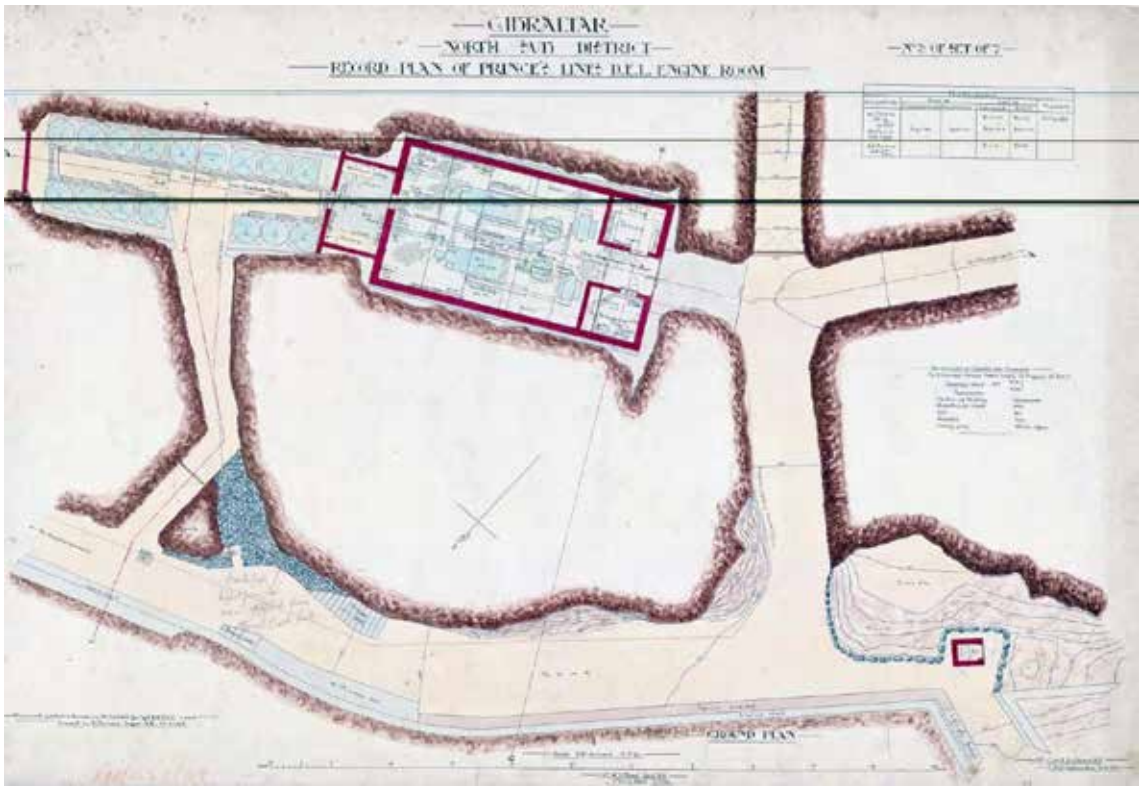
gallery. However, approaching the mass of the Orillon Fault (the outcrop which separates the King's from the Queen's Lines), they enter a tunnelled section in order to link at grade to the Communication leading back to town. This is Prince's Gallery, 1790.

The original northern entrance to the gallery, now blocked, was by the foot of the Entrenchment Wall (which follows the line of the Orillon Fault running up the hillside). However, a little further south along the Prince's Lines, a deep cutting into the hillside intercepts the gallery.

This point is actually a crossroads. Straight ahead – although the way is now barred by a locked door – is the top of Lower Prince's Gallery, the gun ramp running up from Star Chamber. To the right of this door the gallery leads to the covered way heading south. To the left another closed door seals off the northerly continuation of the original route of Prince's Gallery to the Entrenchment Wall.

Prince's Lines D.E.L. Engine Room

This section of the 18th-century gallery was further excavated in 1908 to form an underground engine room to power the Defence Electric Lights (DEL). This was the first underground generator installation in Gibraltar.



The RE 1908 Plan of the DEL Engine Room and Oil Store excavated within Prince's Gallery. Gibraltar National Archives

The 1908 work comprised a large rectangular Engine and Dynamo Room built within the rock-cut chamber. A small store beyond this opened onto an unlined chamber, also enlarged from the original gallery.

Of similar length, but narrower and lower than the engine room, this was the fuel oil store, with sixteen 600-gallon cylindrical oil tanks arranged vertically against the sides of the chamber. Exhaust and ventilation shafts were provided, the one for the oil store emerging in the Entrenchment ditch.

The DEL Engine Room. The doors at the end open onto the 'crossroads' in the Prince's Gallery; the doorway to the right leads into the later side room and exit

At some later date, possibly during WWII, the facility was enlarged with a side room and entrance excavated alongside the engine room. A second large room was created beyond the oil store, possibly subsuming part of it. The engine room plant has been stripped out, although a number of oil tanks are still in place.

Castle Communication & Lower Union Gallery

At the southern end of the Lines, above King's & Queen's Communication, there is another link to the town: Castle Communication, a short tunnel dug to connect directly to the Moorish Castle Barracks. From here, a covered way, Lower Union Communication, climbs the hillside to the bluff at the top of the Entrenchment Wall. Here the route enters a tunnel driven into the hillside leading to a run of four casemates, carved out of the rock. This is Lower Union Gallery.

Lower Union Gallery: Casemate no.21, the first of the three original(?) casemates which open directly off the gallery

The casemates are numbered 22–19, the numerals being elegantly carved adjacent to each position. In 1859 three 24-pdr smoothbore guns were emplaced here. Casemate no.22 may have been a somewhat later addition. It is set above the level of the gallery, being accessed up a narrow cleft within the rock – presumably the continuation of the fault line? This is laid with a flight of concrete steps, which would seem to date from World War II. Emplacing a gun here, in any period, would have required considerable effort.

Lower Union Gallery: the entrance tunnel from the eponymous Communication and the flight of steps leading up to Casemate no.22

The Middle Galleries: Upper Union, Queen's & Willis's

Exiting Lower Union Gallery onto Upper Union Communication, a final short but fairly stiff climb brings us to some squat pillboxes providing World War II defence of the entrance in the rock face to the 1788 Upper Union Gallery. (See the plan under **Northern Defences**.)

This venerable gallery continues to climb, with a series of spacious rock-cut casemates piercing the crags rising above the Prince's & Queen's Lines far below. In some of these casemates the flagstone gun floors, mantlet rails and iron rings for running out the guns remain in situ. All that is lacking is the guns.

In 1859, similarly, they were armed with 24-pdrs – eight of them in Upper Union Gallery, upgraded to seven 64-pdr RMLs in the 1880s. This marked the zenith in terms of gallery firepower. By the end of the 19th century, gallery armament had been restricted to quick-firing guns and machine guns.

A pair of the spacious rock-cut casemates of Upper Union Gallery

Upper Union Gallery links with the slightly earlier (1783–86) Queen's Gallery and thence Willis's Gallery (1789). Collectively, these are known as the Middle Galleries. The 18th-century and 19th-century ordnance mounted in these galleries was similar.

Both Queen's and Willis's Galleries open onto Willis's Plateau, long an important element in Gibraltar's defences, housing a number of batteries. These positions suffered badly from counter-battery fire during the Great Siege and doubtless this experience contributed to the subsequent decision to construct protected casemates in underground galleries.

The recently identified SOE Wireless Room: it would be interesting to know what innocuous function was ascribed to it at the time...

By World War II, these casemates seem to have found a multiplicity of other uses, ranging from cookhouse to position finding cell to SOE's clandestine wireless room (see *Subterranea* 47). As noted, by this date, the

galleries were also linked into the Royal Engineers' extensive new tunnel network via the underground nodal point dubbed Clapham Junction, making the Northern Defences a physically integrated part of Fortress Gibraltar.

A casemate converted to more domestic use. Photo Clive Penfold

Acknowledgements

My thanks are due to Carl Viagas and Pete Jackson for their company over the hours we have spent tramping and discussing the Northern Defences.

I am grateful to Gibraltar National Archives / HM Government of Gibraltar for permission to reproduce copyright images and to Gibraltar National Museum for permission to reproduce photographs of the Royal Engineers' 1865 Model of Gibraltar.

Notes

1 A more comprehensive account of the Northern Defences, charting their development within the context of Gibraltar's Land Front, and covering the surface structures as well as the subterranean works, is being published in three parts in the Fortress Study Group's magazine *Casemate*.

2 John Drinkwater, *A History of the late Siege of Gibraltar*, 1785.

All photographs are the author's unless specified otherwise.

Wartime Pamphlets of the Geological Survey

Paul W. SOWAN

Rich as the UK is in geological variety, there has always been a need to import certain industrial minerals for specialised purposes. Since its foundation in 1835 the British Geological Survey (until 1965 known as the Geological Survey of Great Britain, and from 1965 to 1984 as the Institute of Geological Sciences) has had a strong commitment to practical economic geology to serve industry, and incidentally to pure research. The Survey therefore was looked to for advice on industrial mineral resources during both World Wars.

During World War I optical grade glass-sand, until then largely imported from Belgium and France, was of course unavailable … just at the time when there was a massive demand for high quality glass for periscope prisms, lenses for binoculars, and the like. It is a result of investigations by the Survey that a large deposit of the quality of sand required was identified at Loch Aline, on the Scottish mainland to the north of the Isle of Mull. This unlikely location continues in business to this day (or at least has done so until recently) as a mine working Cretaceous silver-sands. Glass sand was sent out by boat to the south Lancashire glass-making district.

During WWII the Survey examined large numbers of mineral deposits which ordinarily would have been of very marginal economic interest. Results were published in a series of *Wartime Pamphlets* which thus constitute a little-known source of information on the history of the extractive industries.

Some of the deposits examined did indeed prove of limited or no value. Wartime Pamphlet 33 (Kenneth P. Oakley, *Glauconite sand of Bracklesham Beds, London Basin*, 1943) seems not to have led to any active mining or quarrying. Glauconite, an iron potassium silicate (often with some aluminium and magnesium as well) is the dark green mineral from which the Lower and Upper Greensands take their names. It also occurs in other sediments of marine origin in S.E. England. Potential uses of glauconite included agricultural fertiliser, a green mineral pigment, a sorbent for clarifying and filtering oils, a water-softening material, a source of potassium, and a source of potassium compounds. Localities investigated as sources of glauconite included sites in Berkshire, Hampshire and Surrey (including Chobham Common, Farnborough, Sunningdale, Weybridge, Windlesham, Woking, and Worplesdon). Some sites were in fact already being exploited for other purposes such as brick-making, so information on actual active extractive industry is included. In other cases, more useful minerals were surveyed, and some titles appeared in multiple parts and in more than one edition. I am currently compiling a bibliography of all editions of all parts. There are very useful bibliographies in each part.

Many titles deal with water supply from underground sources, but most of the contents of these were later republished in the well catalogues series previously noticed. Other titles of possible relevance to S.E. England include 8 (*British phosphates (1840 - 42)*), 21 (*Ochres, umbers and other natural earth pigments (1942)*).

Some *Wartime Pamphlets* had a 'security' classification, and even as late as June 1945 *Wartime Pamphlet* 20(viii) (dealing with underground water supplies in the Epping and Hertford areas) was labelled …

> This document is CONFIDENTIAL, and should be kept under LOCK and KEY. It should be destroyed if there is any danger of its falling into the hands of enemy agents.

Northampton Coal Mine

Adrian Armishaw

Readers with a geological interest may look at the title of this article and assume that a mistake has been made. They would be correct, although it was a mistake which was made 184 years ago. As I write, I am currently in lockdown so I thought it might be interesting to attempt to research the story by only using sources available online.

I first became aware of the story shortly before the Sub Brit visit in Nottingham two years ago, hosted by the **British Geological Survey**, through searching their borehole and well maps and records. These are a very useful historical resource as they are often identified with the industry or company which created them, revealing the locations of former breweries, laundries etc. which are long gone. Most of the deeper wells in this area were around 50–70m (164–230 feet), so it came as a surprise to find one of 295m (967 feet).

Background to the project

By the end of the 18th century, Northampton had become a major centre of footwear and leather manufacture. In 1801 the population was 7,020 and it more than doubled to 15,351 by 1831, fuelled in part by the demand for footwear caused by the Napoleonic Wars of the late 18th and early 19th centuries. Around a third of adult males were shoemakers at the time and Northampton soon grew beyond the medieval town walls and industry expanded rapidly with the mechanisation of factories.

The Northampton arm of the Grand Union Canal was opened in 1815. The first railway to be built into Northampton was the Northampton and Peterborough Railway, a branch from the main London and Birmingham Railway from Blisworth to Peterborough through Northampton which opened in 1845 along with the town's first railway station, Bridge Street.

It is against this backdrop of growth and prosperity that in June 1836 a prospectus for the Northampton Union Coal and Mining Company appeared in the *Northampton Mercury* looking for subscribed capital of £18,000 in 6,000 shares of £3 each.

The Prospectus

"The great price of Coals, and the advance on that very essential and absolutely necessary article in housekeeping, &c. induced several persons to form a Provisional Committee, who sent a deputation for two experienced colliers from Staffordshire, to come to Northampton, and examine the strata of stone, clay, &c. which they have done, and are of the opinion that coals are to be found within one mile and a half of the Town of Northampton.

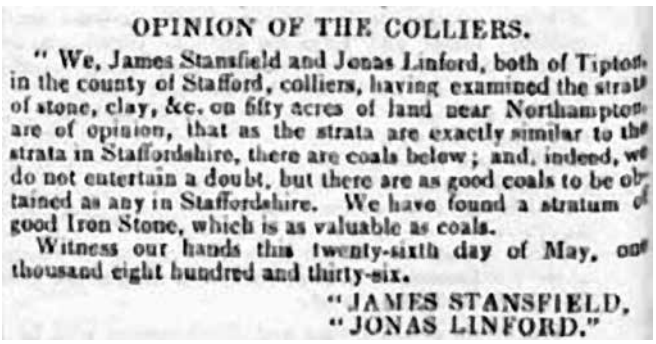
"The result of the inspection, and the favourable opinion of the colliers, led to an application being made to the owner of the land, who at once agreed with the Provisional Committee for 50 Acres on such terms as must prove highly beneficial and advantageous to the shareholders, as well as to the inhabitants of Northampton and its neighbourhood.

"A great feature of the undertaking is, that Coals will be supplied to the inhabitants of Northampton and its neighbourhood, at one half of the present price of Coals, and inasmuch as the river Nine or Nen is very near, and the projected South Midland Railway will run close by the spot, Coals may be sent from, instead of being brought to Northampton, and forwarded to London and other places, and delivered at half the present prices, and yet secure to the shareholders an immense profit on their shares.

"According to a moderate estimate, full one hundred and fifty percent per annum will be realized, on Coals being found, to the shareholders, independent of the advantages derived from the consumption of gas, lime, bread, malt, beer, &c. which will all be much reduced in price in consequence, and the consumers of coals generally be greatly benefitted; and indeed this undertaking is one that presents greater advantages to the shareholders, and to the inhabitants of Northampton and its neighbourhood, than any Company that has ever been projected in the county of Northampton."

The opinion of the Colliers

"We, James Stansfield and Jonas Linford, both of Tipton, in the county of Stafford, colliers, having examined the strata of stone, clay, &c. on fifty acres of land near Northampton, are of the opinion, that as the strata are exactly similar to the strata in Staffordshire, there are coals below; and, indeed, we do not entertain a doubt, but there are as good coals to be obtained as any in Staffordshire. We have found a stratum of good Iron Stone, which is as valuable as coals. Witness our hands this twenty-sixth of May, one thousand eight hundred and thirty-six."



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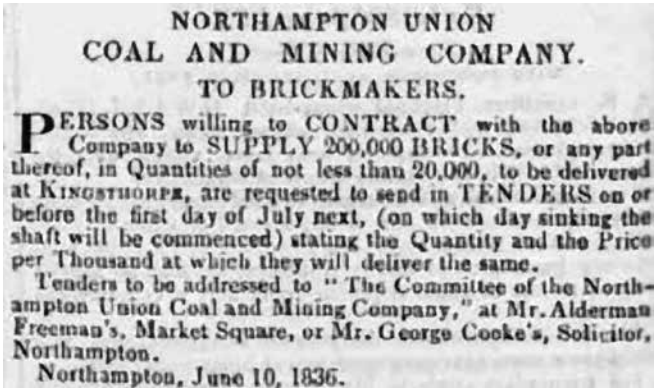
Witness our hands this twenty-sixth day of May, one thousand eight hundred and thirty-six.

" JAMES STANSFIELD,
" JONAS LINFORD."

The opinion of the two Staffordshire miners who were asked to advise on the undertaking

On the same page an advert also appeared stating: "PERSONS willing to CONTRACT with the above Company to SUPPLY 200,000 BRICKS, or any part thereof in Quantities of not less than 20,000, to be

delivered at Kingsthorpe, are requested to send in TENDERS on or before the first day of July next (on which day sinking the shaft will be commenced), stating the quantity and Price per Thousand at which they will deliver the same."



NORTHAMPTON UNION
COAL AND MINING COMPANY.
TO BRICKMAKERS.

PERSONS willing to CONTRACT with the above Company to SUPPLY 200,000 BRICKS, or any part thereof, in Quantities of not less than 20,000, to be delivered at KINGSTHORPE, are requested to send in TENDERS on or before the first day of July next, (on which day sinking the shaft will be commenced) stating the Quantity and the Price per Thousand at which they will deliver the same.

Tenders to be addressed to "The Committee of the Northampton Union Coal and Mining Company," at Mr. Alderman Freeman's, Market Square, or Mr. George Cooke's, Solicitor, Northampton.

Northampton, June 10, 1836.

An invitation to tender for 200,000 bricks in 1836

The next mention of the mine in the *Northampton Mercury* was an entertaining report of the general quarterly meeting of the shareholders which was held at the Peacock Inn, Northampton, on 22 April 1840. The following address was given by Mr Joseph Holdsworth, a geologist of much practical experience: "An Address on the nature and prospects of the Kingsthorpe Mining Undertaking."

It is probably fair to say that things had not progressed quite as well as expected.

Holdsworth's Address

"Gentlemen,

It is, I assure you, with more than ordinary feelings of satisfaction that I attend here this evening for the purpose of descanting on the prospect of your spirited exploring enterprise at Kingsthorpe, not on account only of the preference you have awarded me for this important purpose, but the assurance that your present selection was principally dictated by the consideration that the geological disquisitions and deductions contained in my late published report, respecting the prospective development of your continued mining operation, had thereby been subsequently proved to be quite correct.

Had you, when your arduous labours were first commenced, then appealed to a solely scientific geologist for information or encouragement, he would have certainly so alarmed and disheartened you by his description of the thickness and number of the geognostic depositions geologically overlaying the red marl formation (or its relative position) at Northampton, that, had that alone been the object of your research, you would have cast aside your mining implements in despair, and, in all probability, ever after having believed, with others, the utter impossibility of reaching even that formation, which however, your patience and untiring perseverance have at length brought to light; and which fact – will ever remain on record, to confuse and refute such like, frequently too presumptive, calculations and predictions of scientific enquirers.

Some three years ago, I ventured to repudiate the geological arguments of a gentleman of this school – published in the *Northampton Herald* of that period – touching the aforesaid physical peculiarities affecting your undertaking, and thereby, forsooth, drew down upon my devoted head such a tirade of sarcastic ribaldry, as occasioned me, in self-defence, to hurl back a little of the worthless stuff at the prolific cranium of my confident opponent, and which, for ought I know, may have been the death of him, for he has not appeared before the public since, that I am aware of, at least certainly not in his old presumptive geological garb.

When, by allusions to certain practical experiments in various parts of the kingdom, I then attempted to exhibit the high probability of your being enabled by reasonable exertions to penetrate through the secondary formations of this district, he ridiculed the idea, calculating, with a sort of mathematical certainty, the aggregate thickness of Oolites and Lias of the Midland Counties, and thereby coming to the moderate conclusion that it would be physically impossible for you to ever get through them at Kingsthorpe, even though you employed a steam borer!

But your spirited experiment has now proved the fallibility of such adventurous assertions; it has, as we shall presently shew, done more; it has even taught the professors of the science, when treating all of these matters, to use the language of moderation and carefulness, even to such an extreme of caution, that when applied to for scientific information, where simple practice is perseveringly continuing to develop the geognostic mysteries contained in the book of Nature, they will sometimes not adventure even to the verge of an opinion.

When I examined the excavated specimens of the various strata perforated by the shaft at Kingsthorpe, preparatory to preparing my late report thereon, I felt convinced that you had passed through the great series of middle and lower Oolites, and upper Lias clays into its lower members, and that, consequently, your further workings would soon reach the red marl if there entirely absent from its true geological position (not then an improbable supposition), you would at once, on leaving the Lias, enter upon the great Coal formation.

1887 1:2,500 OS map

The geological section – to which I now beg to direct your attention – of the strata of this neighbourhood, will at once forcibly and clearly illustrate the truth of these predictive calculations; the whole particulars of which section I have the gratification to state, were delineated precisely as you now see them here, while I was sojourning in the Isle of Wight for a short time last summer, and when you were passing through the lower Lias bands, prior to the discovery of the red marl, as here distinctly shewn by the then deepest position of the shaft.

At the period referred to, however, many persons, and some clever geologists too, believed that I was wrong in declaring that you had penetrated the lower Lias beds, and (with the exception of the excellent and learned historian, Mr Baker, of Northampton) treated the idea of you ever reaching the red marl formation, in this neighbourhood, as perfectly chimerical!

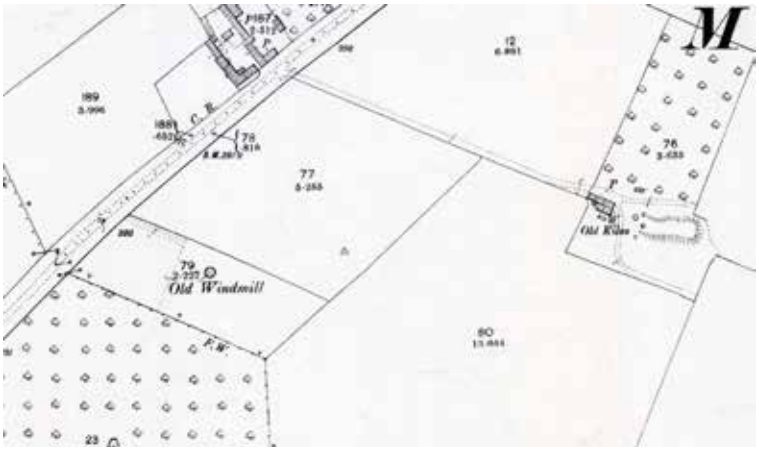
But what has already been the actual result of your perseverance? Let us refer for this information to the geological luminary of Oxford, Dr Buckland! That deservedly distinguished geologist has recently honoured your Mining works with a personal examination, and he thus in effect expresses himself in a letter to your Solicitor, Mr Cooke, on the subject.

After stating the facts of your having passed through the Oolites and the Lias, he says, "I believe the lower beds now penetrated, to be the grey and sandy beds of the red marl formation (the *Keuper* of the Germans) in the vicinity of which there is usually salt; beneath this the thickness of the lower members of the new red sandstone then is usually very great, before we arrive at the coal formation, which is very often wanting, and which may not be present, beneath the parts of Northamptonshire where you are searching for it."

Such, Gentlemen, is Dr Buckland's confession of the correctness of my late published predictions as regards your present geological discoveries, and such also is the Learned Professor's "*opinion*" respecting the existence of the grand object of your research, and which I need not tell you is no opinion at all! Such extreme caution and guarded timidity is, however, very excusable indeed, where so much of doubt and mystery still prevails, as to place a high geological reputation in fearful jeopardy!

The Doctor expresses his belief, that the *lower beds now penetrated* are that position of the red marl series termed "*Keuper*", but of this, I have no doubts, for as you are now upwards of 30 yards in the red marl formation, it would appear that if the *Keuper* is there present, you have now in all probability passed through it into the lower beds of the new red sandstone, the grand source of brine springs.

Besides, we have the authority of Mr Murchison for believing that the *Keuper* would be found of inconsiderable thickness in this district, he having traced it from the borders of Gloucestershire, through Worcestershire into Warwickshire, and never found it to exceed 40 feet in thickness, and although it must be admitted that the vertical dimensions of the sandstones beneath are sometimes considerable, they are nevertheless frequently found extremely attenuated; and as the *lower* beds which are now being penetrated, are lithologically analogous to the white, softer, arenaceous beds of the *Bunter-sandstein*, there can be but little doubt of the speedy disappearance of the whole red marl series.



1901 1:2,500 OS map

Touching the actual discovery of the coal measures by your recent borings, there is only one circumstance it may be well to allude to here, viz. that there often exists so great a similarity between the mineralogical character of the fine, white sandstones of the lower red-marl series and those of their sub-neighbour the coal measure sandstones, that it is next to impossible for the most efficient judge to distinguish merely by the pounded specimens brought up by the auger, which of the two formations you may actually be perforating. If, however, the last stratum but one (20in. thick) described in your sections of the measures as black shale with coaly partings, is what it is represented to be, there can scarcely remain a doubt that the borers have already entered the upper series of the coal formation, but your contemplated further sinkings will at once decide this question.

Having now, I trust, sufficiently demonstrated the fact of your mining operations having geologically reached the vicinage of the great Coal formation, it only remains for me to consider how far it will be safe and proper to exceed Dr Buckland's very indefinite position, "That the Coal formation *may, or may not*, be present beneath that part of Northamptonshire where you are searching for it."

In order to form a just estimate of the merits of this important, this – I may with justice say – national desideratum, it will be necessary to glance at the analogous evidence presented by sober nature; in fact, in this peculiar instance, it is the only means in our power of coming to any rational conclusion; for in the necessarily total absence here of all those actual local indications – by which the presence of Coal is at once ascertained in the great mining districts, – this estimate can alone be founded on general geological principles.

In numerous places in this kingdom most ample evidence may be obtained of the *vast continuous extent* of the great independent coal formation. In the Counties of Durham and Northumberland, we find it occupying an area of 837 square miles! (of which it is calculated 105 are excavated) and thence disappearing beneath the magnesian limestone and red marl formation till it is again seen in the vicinity of Leeds, from which place it trends to Nottingham – a distance of fifty miles, – and there again merges beneath the red marl only, which now conceals it till we reach Leicestershire, – and there, independently of its denuded or exposed tracts, it is wrought with great extent and profit beneath the aforementioned siliferous formation.

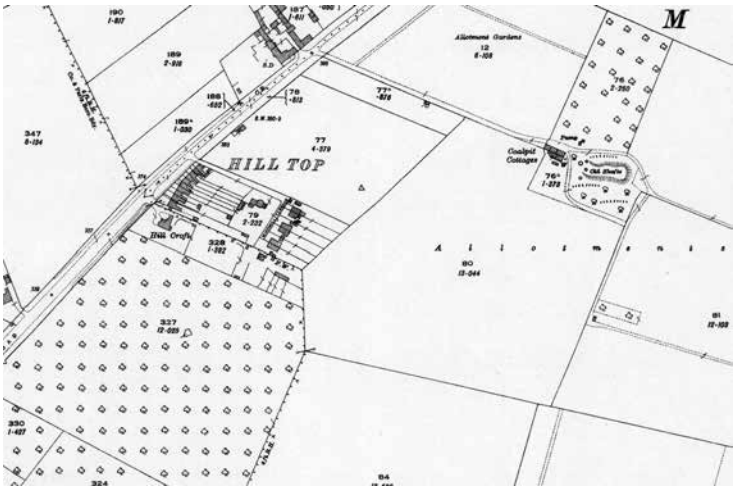
In Warwickshire we again find the Coal measures under similar circumstances to the last mentioned, and at length altogether disappearing beneath the great secondary formations of the Midland Counties. And, now, let me ask, who will be bold enough to assert – after having duly contemplated the vast geographical extent of the grand carboniferous chain to which we have alluded – that those Coal measures are not co-extensively at least, continued beneath the secondary depositions just adverted to?

In the more northern and central parts of England we find the Coal formation presenting itself to the surface in large denuded areas, or merging beneath the new red sandstone; from the surface of which, and even from that of the Lias and Oolites in the South Western Counties, it is advantageously wrought. With what possible show of justice then, are we to disbelieve, nay doubt, its presence in the more Southern or South Eastern parts of the Kingdom, or to attempt to ascribe limits to its as yet unproved subterranean wanderings? Surely we are not the more to doubt its existence there, because nature happens in those districts to have effectually concealed it from our sight, by the accumulated deposits of more recent periods?

With the comprehensive and satisfactory evidence now adduced, stretched out as if it is before us on nature's map, must it not appear – even to the most determined sceptic – perfectly justifiable, indeed, meritorious, to encourage the searching for Coal by spirited and efficient means, in these hitherto unexplored districts?

But, prior to the developments of your enterprise, the geologist discountenanced the idea, under the plea that in this neighbourhood it would be impossible even to reach the red marl, on account of the vast existing accumulation of the superior Oolitic and Lias formations; but of the fallibility of which reasoning you have now happily produced testimony "strong as Holy writ."

That same red marl formation which entirely disappears to the S.E., beneath the Lias escarpments 25 or 30 miles to the N.W. of Kingsthorpe, you have actually discovered at that place! and if we advance but eight or ten miles further towards that point of the compass, we should tread upon the Coal measures of Warwickshire, where in turn, we should also find them disappearing to the S.E. and W., beneath the aforesaid new red sandstone formation, and which, in every probability, as has already been elucidated, they accompany – with perhaps but few local exceptions – throughout its whole geographical extent.



1926 1:2,500 OS map

These, gentlemen, are encouraging considerations indeed and they are also invaluable ones, because they are founded on indubitable deductions from analogous natural examples; they at once destroy the nicely and studiously balanced equilibrium of the professor's professional scales, with his *"it may exist"* in one, and his *"it may not exist,"* causing the former to preponderate with a weight and decision not to be mistaken!

Be it however understood, that I would not be thought to under-rate the learned Doctor's well known geological acquirements, nor do I take upon myself to place my geological judgement on an equal footing with his own, but on that knowledge I have acquired of the science, by long directed and attentive examinations of the geognosy of almost every part of the kingdom, – by my own practical experiments, – and by much reading and study. I do fearlessly presume thus publicly to intimate that the Doctor has far more vaguely, indefinitively, and unsatisfactorily expressed himself than the actual circumstances of the case would seem to justify.

To assert that Coal does positively exist beneath the recently discovered red marl at Kingsthorpe, would be but a premature and presumptive decision of a question, which it must be apparent to every one, the miner alone can solve. But, it is another and most essential thing to point out and adduce clear and incontrovertible *reasons* – as suggested and supported by actual analogous evidence – for believing that Coal is quite as likely to be found beneath the red marl there, as we have demonstrated that it does abundantly exist (and is geologically placed) beneath that formation in the more northern and other explored districts.

Indeed, to the interested, and the observant generally, but to the geologist particularly, your unrivalled

undertaking now assumes a character of the most intense interest, – in so much that one would really imagine that the whole neighbourhood, and especially its *Landed Proprietors*, would inundate you with liberal offers of pecuniary assistance! but alas! for their country's internal advancement, the participation of the latter gentry in such spirited enterprises is of but mere occurrence; they seem, in fact, to have imbibed too much of the spirit and essence of the Bard of Avon's words. When he says:

> The jewel that we find, we stoop and take it,
> *Because we see it;* but what we *do not see,*
> We trend upon, and never think of it.

This, however in the present instance, is far from being the case with yourselves, for upwards of two years before the finger of science pointed out the place of the jewel of *your* research, you continued perseveringly groping your dubious way, as by *instinct,* towards its red-marly *harbinger,* which you have now to rejoice in the discovery of; and as your thoughts about it, I will venture to say they have been as exciting and incessant as your expensive labours.

You have now however – as in the course of this address you cannot fail to have observed – the satisfaction of feeling that in the estimation of well-informed geologists, you may, with an ardour bordering on enthusiasm, resume on the most rational and encouraging grounds your important operations.

In conclusion, I may just observe that it has been a matter of complaint, by one of our most celebrated geologists, that the coal beds existing beneath the new red sandstone of the central counties have been entirely omitted in our national estimates of 1830, which were chiefly made with a view to a calculation of the probable duration of British Coal. It is, however, I think, more to be regretted that due encouragement is not given to individual enterprise by the *State,* so as to facilitate the more effectual exploration of those mostly improved districts; – a course of policy which would be far more rational, creditable, and pregnant with national benefit, than three-fourths of the new-fangled schemes now daily broached by designing and interested politicians for the *public good.*

I have yet to name one other circumstance which I cannot help thinking is of the utmost consequence to your collective interests, and that is, respecting the judicious and effective application of the fine *saline* water your sinkings have discovered. From Mr Greville's analysis, as published in my report, Professor Graham's, and one or two other eminent chemists, its medicinal properties appear to be quite equal, if in some respects not superior to the *saline* waters of Ashby-de-la-Zouch and Cheltenham.

But within the last few days I have become acquainted, on the spot, with the particulars of certain circumstances which bear such a striking analogy to those generally characterising your Kingsthorpe undertaking, that I cannot but adduce them as presenting a peculiar instance of what may be achieved when such fortuitous circumstances happen to fall under the scrutiny and direction of competent, persevering, and public-spirited individuals.

At a village called Woodhall, about five miles from Horncastle, a very spirited trial for coal was made about three years ago, and which by sinking and boring was carried to a depth of 380 yards, where it was terminated solely for the want of adequate means to prosecute the work.

However, somewhere about this depth, and when apparently in the red marl formation, a powerful saline spring was discovered, which subsequently coming to the knowledge of Dr Bolton of Horncastle, that gentleman bestowed considerable pains in its analysis; and, finding that it possessed valuable medicinal properties, he advised the new proprietor of the Estate – Hodgkin, Esq. of Tixover – to erect ample and appropriate accommodation for invalids, which recommendation was forthwith so spiritedly and effectively adopted that, as Dr Bolton himself informed me, during the last year, an income of no less than between £800 and £900 was realised by the speculation, from invalids alone!

These *saline* waters, which also contain about one-eighth of a grain of *iodine* to the pint, are found to be peculiarly beneficial in rheumatic complaints, scrofula, and chronic affections of the liver.

Now, gentlemen, here is a signal example for your consideration, alike worthy of your attention, and your most spirited imitation. Your valuable discovery, has, however, the superior advantages of being made in a more enticing and central neighbourhood.

The town of Northampton itself is universally admired for the eligibility of its site, its internal attractions, the salubrity of its air, and the rural beauties of its surrounding country; and since the *"wise men of this Montpelier"* have thought well, by virtue of their most strenuous exertions, to deprive it of the great advantages which must have resulted from its contemplated close connection with the Great London and Birmingham Railway, but which "men of authority", it appears, afterwards thought well in the exercise of their secondary wisdom, to spend, or cause to be spent, nearly as much money in the vain attempt to rescind or counteract their ill-judged opposition to the aforesaid intended line of Railway, as you have done in endeavouring to achieve the grand and laudable object of supplying this place with mineral fuel from its own pits!

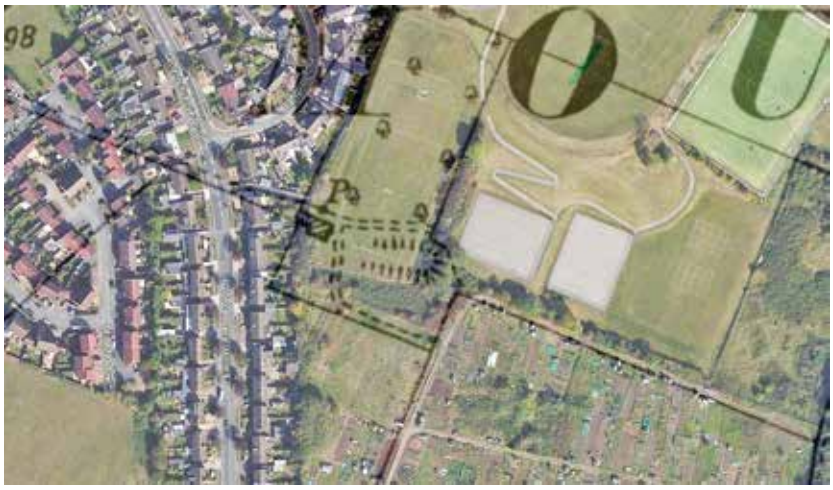
It behoves you, then, I say the more, not only strenuously to continue your mining undertaking, but so to apply the *physical* advantages which nature and perseverance have already placed at your command, as to enable Northampton ultimately to become a powerful rival to Leamington or Cheltenham, or perhaps as attractive to visitors as any other internal watering place of the Kingdom.

Gentlemen, I have now only to observe, that I heartily wish you that encouragement and success which it would seem the present character of your cause so flatteringly promises, and which the public spirit you have, through evil report and good report, so long exhibited, most deservedly and justly merits."

The address having been delivered, it was resolved that One Thousand additional Shares should be forthwith submitted for sale to the public, for the purpose of raising sufficient funds to enable the Committee of Management to proceed with the Works.

BGS borehole information

The Kingsthorpe entry in *The water supply of Beds. and Northants.* says 'The Kingsthorpe shaft was made in 1836 by a company styled "The Northampton Union Coal Mining Company." After the expenditure of £30,000 without either finding coal or proving its absence the works were abandoned.'



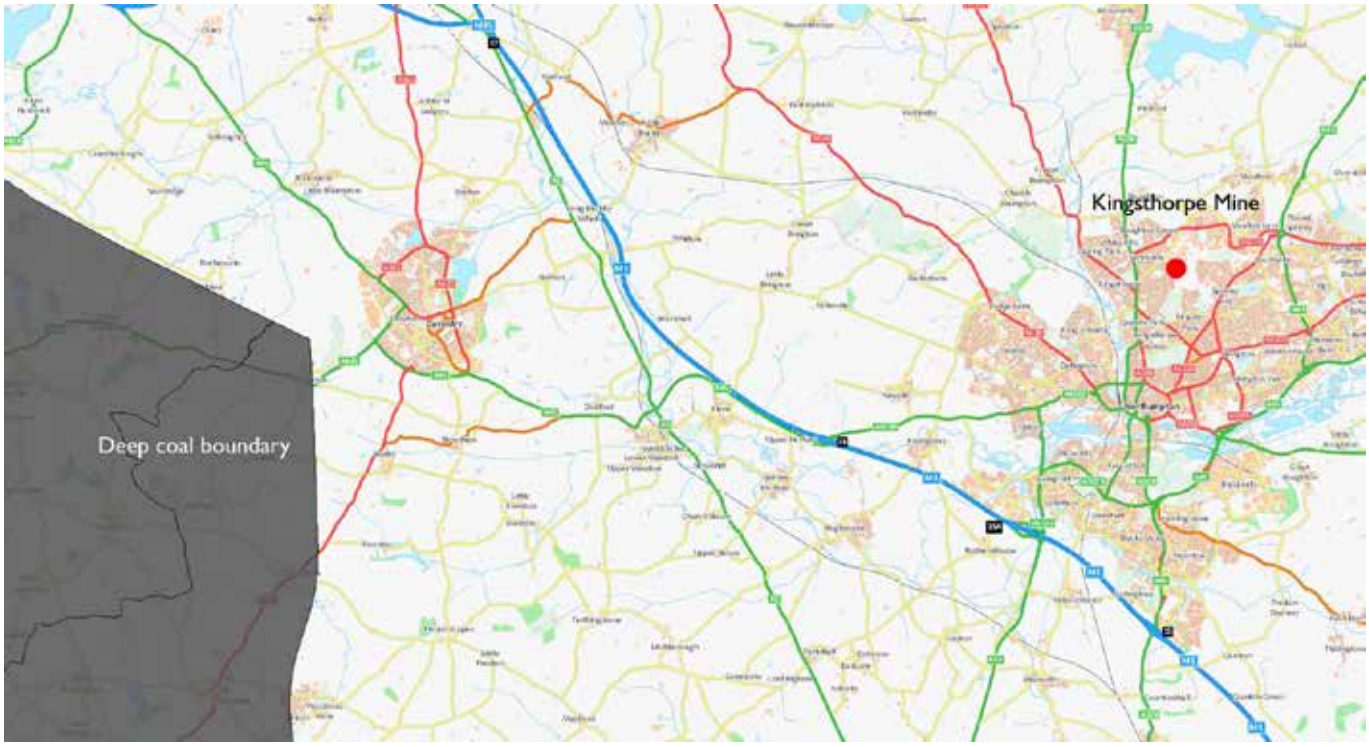
Map overlay showing the position of the workings to the east of the modern Eastern Avenue North

This may well have been the end of the story, however, on August 5th 1854 a second prospectus was published in the *Northampton Mercury* by the Northamptonshire Great Central Coal Mining Company, with a stated capital "of £21,500, in Twenty-one Thousand Five Hundred Parts or Shares, of £1 each paid up, and no further liability. To be conducted on the Cost Book Principle. Held under Lease, of which 22 years remain unexpired, from the 29th day of September, 1854."

The second prospectus

"The period having arrived when a combination of fortuitous and most advantageous circumstances, both of a local and general nature, have greatly enhanced the importance so long attached to the discovery of coal in the more southern portions of the Kingdom, it has been resolved to form a powerful company for the purpose of resuming operations at the Kingsthorpe shaft, which several years ago, though then presenting such high promise of a successful issue, were obliged to be suspended for the want of adequate capital to carry on the works.

"The property on which this mine is situated, consists of fifty acres, lying in the parish of Kingsthorpe, near the turnpike road leading to the populous town of Northampton, about two miles distant. The works to which it is now desired to invite the particular attention of the general public, were commenced (for the discovery of coal) on the northern verge of the Middle Oolite Strata, and were continued to a depth of one hundred and sixty fathoms. In the course of this sinking, a number of facts of a most encouraging character were



British Geological Survey online data showing the extent of deep coal (50-200 metres depth)

developed, and which have far exceeded the most sanguine expectations of persons conversant with the geology of the neighbourhood.

"The formations of the Lower Oolite, Lias and Red Marl, which geologically intervene between the site of these works and the great coal formation, were found to be very much thinner than their estimated thickness, and at the period of the suspension of the works there was the strongest evidence for believing that the miners had actually penetrated some distance into the coal series, especially as a conglomerate rock, six feet thick (exactly similar to the one existing in the same geological situation, and resting on the coal measures in Staffordshire and Leicestershire), was found at the base of the red marl formation, and in the lower beds of which a strong brine spring was discovered.

"It is almost unnecessary to observe, that independently of the highly encouraging prospects, now so palpably exhibited of the discovery of coal in this part of England, it is a consideration of the greatest consequence to landed proprietors and to the local interests generally, and when viewed in connection with the recent important discoveries of inexhaustible iron ore beds (thousands of tons of which are weekly sent out of the county to be smelted) in this immediate neighbourhood, the Great Central Coal Mining Project may be truly said to assume an aspect of great national importance.

"In order to carry out the pregnant enterprise effectually, it has been deemed advisable to raise a sufficient capital in the outset to erect a powerful steam engine, and to meet all contingencies which may possibly arise in the progress of a work of this character; and it is confidently expected – from the various and very inviting circumstances shown to warrant so strong a belief in a successful issue of the undertaking, to say nothing of the present high price of coal – that the shares will be rapidly taken up, and that the operations will again shortly be in a state of full and effectual progression.

"The projectors propose to raise a capital of £21,500, in twenty-one thousand five hundred parts or shares of £1 each, the sum provided being much larger than it is considered will be requisite to meet every contingency."

Conclusion

This is the last reference that I could find from the time referring to the works, although I hope to research it in greater detail once it is possible to study copies of *The Mining Journal* from the time.

There are several 'folk' versions of the story locally, including one where a farmer emptied a sack of coal down a well and persuaded investors to part with their money. It is interesting to note that the adventurers may not have been as misguided as it at first appears. The BGS map of deep coal deposits (50–1200m) reveals the presence of coal 14 miles to the west, just beyond Daventry, and even 2m-thick seams at between 600m and 1200m depth only two miles further, which marks the eastern boundary of the Warwickshire Coalfield.

Sources

BGS borehole data

British Newspaper Archive, *Northampton Mercury* and various regional newspapers of the time.

An 18th century road tunnel at Liverpool

Before Joseph Williamson [1769 - 1840] started his extraordinary tunnelling at Edge Hill, and before the first Liverpool & Manchester Railway tunnels were driven in 1827 – 1829, there was already at least one tunnel, of handsome dimensions, at Liverpool. This was a road access tunnel to the Corporation Quarry, the site of which has (since stone extraction ceased) been firstly a burial ground and now a public open space. It is a large opencast working immediately behind (on the north side) of the Anglican Cathedral. In the south-west corner of the quarry can be seen the walled-up inner portal of the tunnel. This tunnel was noted in John Aiken's book '*A description of the country from thirty to forty miles round Manchester*' published in 1795. In Aiken's words …

> An extensive *pleasure walk*, called St. James's, handsomely laid out and planted, was made a good many years since on the high ground above the south end of the town. It commends a fine view of the town, river and distant country, but the bleakness of its exposure makes it agreeable only in very fine weather, and is unfavourable to vegetation.
>
> Behind it, is a most extensive stone quarry, which offers a very striking spectacle. Labour has here exposed to view one continued face of stone, 380 yards long, and in many parts sixteen yards deep, forming a vast perpendicular wall, without a vein or crack.
>
> The entrance to it is by a subterraneous passage supported by arches, and the whole has a pleasing and romantic effect. The stone is a kind of sand stone of a yellowish hue, soft when cut, but afterwards hardening. It is used in the public buildings and works of the town. A chalybeate water of moderate strength springs in the quarry.

The quarry was transformed into a cemetery early in the 19th century, some burials being sealed in rock-cut tombs in the northern working-face. A public access path to the site, now a public open space, passes through a short pedestrian rock-cut tunnel from which the road tunnel portal can be seen. The outer end of the quarry access tunnel is now backfilled and buried.

A German Channel Tunnel?

Steve Fox

When the Channel Tunnel was being planned in the 1980s concerns were raised that it could allow uninvited visitors into England – rabid animals, smugglers, illegal immigrants to name but a few, but in 1941 there were fears that something even more unwelcome might emerge from such a tunnel – the German army!

Panzer IIIs of the 10th Panzer Division approach the Channel in 1940. Next stop Kent?

In 1940, following Nazi Germany's conquest of northern France and the ignominious evacuation from Dunkirk, Britain's war leaders expected an imminent invasion. They assumed this would be a seaborne assault with parachute landings to capture key points in essentially the same style as the Allies would use to liberate France some four years later.

However, some people considered that the Germans might use a unique method of delivering their feared panzer divisions to the coast of Kent – a tunnel under the English Channel. We now know that the Germans had no such intention and the idea may sound preposterous but it bothered some important people in London and it refused to go away. Thanks to the release of documents by the National Archives the tale can now be told.

Strategic Advantage

It starts in early May 1941 when Colonel (later General) L C Hollis, the Senior Assistant Secretary to the War Cabinet, received a letter which started, "I wonder if any part of the Chiefs of Staff organisation [the leaders of Britain's armed forces] has considered the possibility of an attempt by the Germans to build a Channel Tunnel." The letter went on to say that "…the idea sounds fantastic at first sight" but the committee that had considered in detail an Anglo-French Channel tunnel in 1930 had concluded that "…from available evidence it appears probable that the geological and engineering difficulties likely to be encountered could be overcome."

The letter argued that the Germans might take three to four years to build a tunnel but that in wartime they might risk using rough and ready construction methods if they saw a strategic advantage in such a tunnel and "…nothing could help them more" than a Channel tunnel and whilst the writer "…does not pretend to consider it more than a remote possibility, a Channel tunnel would be a very fine secret weapon for Hitler."

He ended by suggesting to Hollis that it would be worthwhile to draw it to the attention of the Joint Intelligence Committee, a sub-committee of the War Cabinet charged with overseeing all intelligence matters. The letter was simply signed "Hankey".

Some people might think that this was a letter written by a crank but Hollis knew that behind the simple one-word signature was The Right Honourable, The Lord Hankey GCB, GCMG, GCVO. He had been Secretary to both the Cabinet and the Committee of Imperial Defence from World War I until he retired in 1938. He was ennobled in 1939 as Baron Hankey and made a member of the Privy Council.

At the time of the letter he was Minister without Portfolio and a member of Prime Minister Chamberlain's War Cabinet. A "suggestion" from such a person could not be ignored.

Adolf Hitler and his staff, contemplating the chances of an invasion while looking across the English Channel from Calais. Hitler might have favoured a tunnel – he couldn't swim!

Hankey had in fact long been interested in a British-built Channel Tunnel, particularly in any effect it might have on Britain's security. The idea of such a tunnel had come up many times throughout the 19th century and digging had actually started in 1880 before the Government had vetoed any further development. This was after General Sir Garnet Wolseley, Quartermaster-General to the Forces, had argued that a tunnel would "destroy the value of the Channel."

However, the idea continued to be raised after the World War I and it was always vigorously opposed by Hankey on grounds of national security. Indeed, in 1919 he wrote in his diary of the proposed tunnel "I will stop at nothing to prevent what I believe to be a danger to this country", and he was able to bring considerable influence to bear from his positions as Cabinet Secretary, Secretary of the

Committee of Imperial Defence and Clerk to the Privy Council.

Difficult and Hazardous

The most credible early tunnel proposal came in 1929. As part of an official enquiry it was considered by the Committee of Imperial Defence of which Hankey was secretary. Unusually, Hankey was given permission by the Prime Minister to break with the usual neutrality of a Cabinet Secretary to give his personal view that a tunnel would make invasion much more possible.

Hankey would go on to be the prime mover in the wartime debate about the possibility of the Germans digging a Channel tunnel through which to invade England. His interests were considerably aided by his position as Chairman of two important War Cabinet sub-committees – the Scientific Advisory Committee and the Engineering Advisory Committee.

Hollis passed Hankey's letter to the Joint Intelligence Committee (JIC) who quickly replied that a tunnel was a feasible proposition although it would be "difficult and hazardous" and, based on rates of tunnelling achieved for the London Underground it would take some six years to build, even under the most favourable conditions. Even if it did reach Kent the Germans would have to take and hold a large bridgehead around the exit in the face of severe British counterattacks.

The JIC concluded that "…the Germans would be unlikely to use this to invade."

The actual "bridgehead" of the Channel Tunnel at Folkestone

Hollis gave this reply to Hankey adding that he was not convinced by the JIC's argument and would ask them to reconsider the matter. Hankey however replied that he would be content if intelligence kept an eye on the matter and the RAF took reconnaissance photos of the French coast to look for evidence of spoil being dumped. Disposal of the spoil from possible tunnel diggings would feature throughout the saga.

A few days after Hankey wrote his letter Churchill succeeded Chamberlain as Prime Minister and Hankey was appointed as Chancellor of the Duchy of Lancaster and, soon after, Paymaster General. However, he was not appointed to Churchill's War Cabinet and was dropped from government entirely in March 1942 after disagreeing with Churchill over policy.

Other Views

Hankey was not alone in his concerns about a subterranean invasion. In February 1941 Major General King, Chief Engineer of Home Forces, had raised the idea of a German Channel tunnel with the President of the Institution of Civil Engineers. He in turn consulted some engineers who reported that it would take twelve and a half years to dig and was therefore unviable.

Maurice Hankey

At the same time, and apparently coincidentally, the Senior Military Adviser at the Ministry of Supply had asked its Advisory Council on Scientific Research and Technical Development to appraise the idea of a German Channel tunnel. The Council concluded that the Germans would not begin such a project unless it could be completed within eighteen months and they thought the work would take twice this time.

Shortly after, in June 1941 John Stourton, the MP for Salford South, wrote to Churchill raising the possibility of a German tunnel. He was told that his idea had been considered but "…must be dismissed."

By this time the notion of an enemy tunnel had been quashed by three independent and expert bodies. Interestingly, this was always on the grounds that the work would take too long or that the work required to dig the tunnel (or possibly to dispose of the spoil from the diggings) would be easily spotted. The estimates to dig a single tunnel capable of carrying a railway track ranged from three to over twelve years.

In fact, when digging for the service tunnel for the present Channel Tunnel was started in 1987 (from *both* sides of the Channel), it took three years to complete using the most modern plant. Back in 1941 no one appeared to be considering if the tunnel was a credible method to use to transport the necessary German troops together with masses of materiel from France to somewhere in Kent from where they would somehow emerge to take on the British home defence forces.

Hankey was, however, not finished with the idea of a German Channel tunnel and on 25 October 1941 he again wrote to Hollis enclosing "some notes" (actually six pages of closely typed foolscap) that he had received from Sir Henry Dale, the President of the Royal Society, which had been "prepared by a respected colleague" concerning the importance and difficulty of detecting German tunnels under the Channel before their completion.

The colleague was in fact Robert Bourdillon who had been a pilot in the Royal Flying Corps in World War I. After the war he trained as a doctor and worked at the National Institute for Medical Research but it appears that he had no background in military or civil engineering.

Robert Bourdillon

Bourdillon asked if any attention had been given to possible German tunnels which may well be built with "precautions against detection", adding "… has anyone proved with certainty that there is no tunnel in existence now, complete except for the last 200 feet, with a number of vertical shafts which may be many miles inland from the coast?"

He added that the Germans had had time to cut the tunnel since Dunkirk, concealed from our agents in France because the spoil from the digging would be concealed by "subaqueous discharge". This would involve mixing the spoil with seawater and pumping it out into the Channel and would allegedly considerably speed up the rate at which a tunnel could be dug.

Bourdillon suggested the Germans might actually bore three tunnels each three metres in diameter and 30 miles long. They could use "unlimited resources" and would be able to dig at twice the rate anticipated by the 1930 Channel tunnel report and complete digging from France in some eighteen months and then enlarge the tunnels to 5 or 6 metres in diameter. He had given some thought to what would happen when the tunnels arrived at, or rather under, Kent.

Bourdillon "…assumed that the tunnel or tunnels would branch at the English coast into 12 or perhaps 20 separate tunnels from one to 10 miles in length each ending in a vertical lift shaft of 200 to 500 feet. Each lift shaft would end in a short chamber cut about 100 feet below the crest of a downland ridge. A series of short horizontal adits would lead towards the side of the ridge but stop 20 feet short of the surface until after dark on the first evening of the invasion when they would be blown open by powder charges."

He expanded these ideas to claim that each tunnel could carry 30,000 personnel and 30,000 tons of freight in 24 hours. Each lift could carry one heavy tank or 25 men every six minutes. If fifty lifts were available they could carry 12,000 tanks a day or 300,000 men.

Detection would apparently be difficult as the Germans would use "relatively quiet rotary cutters" which would be hard to detect by sound, and magnetic detection would be unlikely as the Germans would use little steel. He ended by saying "I think myself that tunnel invasion is one of the most formidable dangers we have to face."

Robert Bourdillon in World War 1 uniform

A moment's thought should have shown that these assumptions made by a doctor with no military or engineering background were ridiculous. His "separate tunnels" allowing 12 to 50 exits into Kent would treble the length of boring apparently without any apparent increase in digging time and with no apparent consideration as to how all the tanks and troops could be transported through the tunnel, and so on.

18-month Construction Time

This would surely been the time to file his paper in the nearest waste-paper bin, but unfortunately this did not happen. Hankey appears to have seized on Bourdillon's ideas, possibly jumping on the suggestion that a tunnel could be dug in as little as 18 months.

In his new letter to Hollis, Hankey said that he had "formed the view that the Scientific Advisory Committee of the War Cabinet should be invited to collaborate with one or two engineers from the Engineering Advisory Committee to consider how such tunnelling could be detected." These were two very important committees and Hankey just happened to be the Chairman of both of them!

Hankey in fact slightly misrepresented what Dale had said to imply that he had greater confidence in Bourdillon's judgement and ability than he actually had. Hankey suggested to Hollis that he could arrange the referral to the committee himself but that the blessing of the Chiefs of Staff might be helpful. Hollis passed the notes to the Vice Chiefs of Staff committee who "blessed the idea" of looking further into scientific methods of detecting any tunnelling.

Hankey also wrote to Dr H J Gough of the Ministry of Supply querying if he knew if others were investigating possible German tunnels. This produced the report mentioned earlier written in February 1941 by the geophysics sub-committee of the Advisory Committee on Scientific Research and Technical Development. The committee had been tasked with considering if it would be practical for the Germans to drive a tunnel under the Channel capable of carrying men and supplies for an attack on Britain and if so to consider how the tunnel could be detected.

The committee reported that the scheme was not credible in the short term given practical problems such as secrecy, disposal of spoil, lack of suitable machinery and ventilation, and the Germans would be unlikely to start unless they could complete it within twelve to eighteen months.

Gough replied to Hankey with this information but added that there were methods to detect tunnelling. He also mentioned that a Major General King, Chief Engineer of GHQ Home Forces, had approached the Institution of Civil Engineers on the same matter to be told by its President that the project was not viable and could take twelve and a half years (as mentioned earlier).

Hankey was not put off by these reports and he promptly wrote to William Halcrow of W T Halcrow and Partners, possibly the best known firm of civil engineers in Britain, who had done extensive work on the London Underground tunnels, and to Sir Henry Tizard (famous for his work on radar) asking if they would join his committee to consider the matter further.

On 14 November Sir Henry Dale sent Hankey another long note by Bourdillon "not because it is likely to be a serious contribution to the problem" but as he had no special knowledge of such matters he did not want the responsibility of withholding the information. In this second note Bourdillon concluded that the tunnels could only be found by "delicate geophysical methods which need time and highly trained experts."

He suggested that listening posts could detect tunnelling in the latter stages when the exit shafts were being dug and this would give one or two days' notice of invasion. Once detected "heavily armoured vehicles carrying 10 tons of explosive could be detonated above any detected exit."

Methods of Detection

So far, anyone who had any expertise of tunnelling had dismissed the idea as impractical essentially because of the time needed to dig a tunnel, and no one had considered if it would be viable from the military viewpoint. It was obviously not but Hankey persisted. He now sent all the papers to Mr D Rickets at the Offices of the War Cabinet, the secretary of the Scientific Advisory Committee and the Engineering Advisory Committee (which as mentioned earlier were conveniently both chaired by Hankey) saying "I do not want to be drawn into a discussion of whether the thing is feasible or not because the experts appear to vary in their estimates from one year to 12 years, and I doubt if any of them are right but our committee should consider the possibility of detection should the Germans attempt to build a tunnel."

Hankey is of course saying he does not know if a tunnel is viable but at the same time saying that it is by wanting to consider how it could be detected.

Hankey also now replied to Dale saying that he had received various reports but was not satisfied and would bring the matter before the Scientific Advisory Committee. Hankey is increasingly interested in methods of detection rather than considering if the Germans were likely to attempt a tunnel invasion. A joint group from the Scientific and Engineering Advisory Committees considered the matter, concluding that a tunnel would take three years to build but that it "should not be considered beyond the bounds of possibility" and committing themselves to looking into how to detect a tunnel.

The group consulted experts on possible detection methods involving magnetometers and "low frequency listening machines" which they thought might detect tunnelling at a distance of up to a quarter mile and 200–300 feet deep.

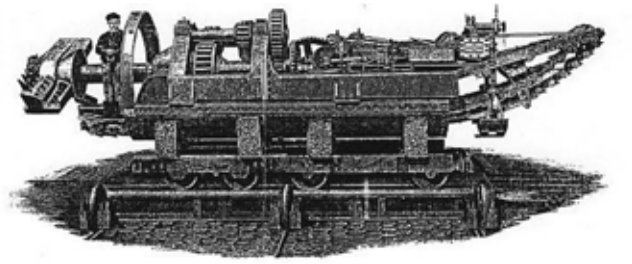
Hankey then wrote to General King, who as previously mentioned had made enquiries a year earlier, but without mentioning that he knew that the General had been told a tunnelling scheme would take 12 ½ years.

He told King that a joint conference of the two advisory committees under his chairmanship was investigating the possibilities of a German Channel tunnel and considering experiments into possible sound detection methods using noises made in the old shaft and tunnel dug by the Channel Tunnel Company in 1921. He asked King if the Chief Engineer at Dover could look into their state. He added that the Committee had discussed dousing as a detection method but this "did not find favour in any quarter."

Existing Tunnel Workings

King replied that there were three tunnel workings around Dover which could stand in for a German tunnel:

* Shakespeare Cliff – where a pilot shaft and heading about a mile out to sea had been dug in 1880 but the shaft was filled in and the tunnel assumed to be flooded
* Abbots Cliff – a 7 feet diameter tunnel had been dug for some 200 yards in 1880–82 which was believed to be open and dry
* Martello Tower, Felixstowe. Here a 12 foot diameter tunnel had been driven for about 100 yards (in 1921) and the boring machine was still believed to be there.



The boring machine used in 1880

At Hankey's request General King arranged for Lt Col Hill, an engineer, to inspect these three sites. Hill closely examined them and found none particularly good. He promptly got a reply from Hankey, however, asking him which of the Abbots Cliff and Martello Tower sites he thought would be most suitable for the listening equipment of the Royal Engineers.

Hill sent Hankey more details with an added remark that there may be more suitable sites at Dover in the

Some of the infrastructure involved in the 1880 work at Shakespeare Cliff

neighbourhood of the castle. He was promptly asked by Hankey for a report on them. They appeared more suitable and Hankey shelved the idea of using the Abbots Cliff or Martello Tower diggings.

Compare this view of part of the Chunnel workings at Shakespeare Cliff which was used solely to handle spoil with the simplicity of the 1880 work

At this time Hankey was Paymaster General in Churchill's government but was no longer in the War Cabinet. However, he was critical of some of Churchill's policies and in March 1942 he was dismissed from the government.

His successor as Chairman of the Scientific and Engineering Advisory Committees was the President of the Board of Education R A 'Rab' Butler. Butler took the tunnel idea forward although it is apparent from the subsequent correspondence that he was not as committed as Hankey, but by now the matter had virtually developed a life of its own.

Butler told the Committee secretary, Henry Everett, to approach the Admiralty's Department of Scientific Research asking if they could carry out the experiments and lend the Committee their measuring equipment. Adding, "…the Royal Engineers stationed at Dover would co-operate and provide the manpower needed for making the noises."

Everett received a less than enthusiastic reply from the Director of Scientific Research who said that the Admiralty experts were the Directors of Torpedo and Mining. He had spoken with them and been told that it was a job for the army and if the matter was to be taken seriously then a more scientific approach was needed "like drilling a close line of bore holes" to monitor the sound.

Everett sent the reply to Butler adding that the Admiralty might be prepared to undertake the work "if you ask the First Lord to give the necessary instructions" but added "Alternatively, should you consider the whole tunnel proposal as fantastic, we could drop the question."

Butler did not take the hint and a long letter was soon on its way to the First Lord of the Admiralty summarising the project to date but saying that the idea of a tunnel was not a real threat because it would be impossible for the Germans to dispose of the spoil (said to be some 40,000 tons for each mile of the 25–30 mile-long tunnel) without it being noticed.

But then despite this and having referred to the several knowledgeable opinions who had dismissed the idea, Butler referred to "A paper commissioned by Sir Henry Dale" which questioned previous estimates of time the Germans might take to dig a tunnel and suggested it would only take some 20 months and the "spoil could be disposed of in a way to make aerial observation difficult."

This was of course referring to the ideas from the unqualified Bourdillon but Butler said, "My Committee, with the help of the best technical advice, took the view that while it would be a great undertaking for the Germans to construct a tunnel in three years such a feat should not be considered beyond the bounds of possibility."

Aerial and Nautical Reconnaissance

The committee had assumed that the Germans would, unimaginatively, follow the route publicly proposed in the 1930 report "so that the danger area would be along [or rather under] a five-mile stretch of the shore east and west of Dover."

Butler finally got to the point saying theoretical ideas suggested to his committee that magnetometers and low frequency listening machines would provide the most promising method of detection but actual experiments were needed and, as the most advanced knowledge in these fields is to be found at the Admiralty, can you assist with men and machines?

He also asked, as a "useful precaution", for ships patrolling the Straits of Dover "to keep a sharp lookout" for any suspicious discolouration of the water from the disposal of spoil. Butler had already written to the Air Ministry asking them to fly reconnaissance missions over the French coast to detect any signs of construction activity. He received a rather short reply saying this was already being done.

The First Lord replied saying that the problem was more difficult than it first appeared, suggesting "it might, in fact, involve some considerable diversion of effort which

can ill be spared" (another hint that was ignored) however he suggested Butler contact the Director of Torpedoes and Mining at the Admiralty. Butler had omitted to tell the First Lord that he had already been (unsuccessfully) in touch with this group.

Everett, the secretary of the two committees who now appears to be doing the work on behalf of Butler, met with Capt Antony de Salis, the Acting Director of Torpedoes and Mining, who told him "suspiciously often" that he was anxious to help but, in fact, "showed considerable hostility to the idea of Admiralty machines and an Admiralty expert being used on the experiments."

He had said that his department's machines were designed to detect noise in water not earth and suggested the army should be consulted and that in any case any efforts at detection would be hit-and-miss and so would be useless (yet another hint that fell on deaf ears).

De Salis then suggested that a series of bore holes would be needed along the 10 mile danger area at 10 feet intervals. This would need 2,640 bore holes; an obviously impractical number, especially as the line of holes would have to go through the town of Dover.

In fact the committees had already considered this and dismissed it as taking too long and being too expensive. Everett eventually persuaded the Acting Director to meet with a mining expert from the Royal Engineers to discuss how the experiments could be conducted.

Mining Experts

Butler then wrote to General King referring to correspondence with Hankey the previous year asking for such a mining expert. This resulted in a meeting being held attended by William Halcrow, who as a member of the Engineering Advisory Committee had previously been involved to explore the possibility of conducting the sound detecting experiments.

Halcrow told the meeting that a tunnel would be a gamble from the German point of view but it would be unsafe to consider it impossible. A 16 ft diameter tunnel would be the minimum practical size to allow a single-track railway and it would only need to be supported or lined in places where rock falls occurred. The most probable cutting method would involve using a rotary cutting machine but this would produce a lot of detectable noise as would the pumps needed to pump the spoil, mixed into slurry with 85 percent water, either into the sea or back to the tunnel heading.

He suggested the first step towards experiments in detecting sound would be to find a suitable site near the Dover shore and to run a "rotary cutting machine into the lower chalk" (the type of rock most likely to be chosen to tunnel through from France). The representative of the Director of Torpedoes and Mining added that two or more listening posts could be set up in "small huts standing on concrete bases…" to listen for the noises made by the cutting machine.

The War Office representative added that the only geophones the army had dated from World War I and were unlikely to be of any value. The meeting however agreed that the experiments should proceed and that a boring machine should be sought. Now, as Everett put it, "the sordid matter of finance" became an issue as while the Admiralty would pay for the listening side they were not prepared to pay for the noise-making. Butler asked the War Office to cover the cost –which it reluctantly did.

At this point Everett contacted Mr G Ellson, the Chief Engineer of Southern Railway, and asked him if the railway had any tunnel that could be used in which the required noises could be made. Ellson had been involved with the 1930 proposals and was yet another expert who was to be very sceptical of the whole idea of a German tunnel.

Ellson replied from the Deepdene Hotel in Dorking, which some readers may recognise as the wartime headquarters of the Southern Railway (see https://www.subbrit.org.uk/sites/deepdene-ww2-southern-railway-traffic-control-centre/). He thought it would be unlikely that the Germans could construct a tunnel from only one end and if they could, it would take at least seven years.

He doubted that a boring machine was available which could cut through the hard lower chalk but the Channel Tunnel Company had constructed a special machine in 1920 for their experimental workings which was still in the Martello Tunnel heading and the company would probably make it available if it was still working. But he thought it would be necessary to bore several hundred feet into the chalk and the spoil would probably wash into Dover Harbour which the Southern Railway would object to.

Boring Machines and Listening Apparatus

This boring machine which Ellson remembered had actually been built in 1921 by Whitaker Brothers in Leeds and had been used to drive a 480 ft long tunnel in a cutting above the Martello Tower railway tunnel in 1922–23.

On completion of the test bore the machine was withdrawn to the entrance of the adit where a shed was built to protect it. It languished there while the shed decayed and the machine became covered in fallen chalk until 1990 when it was recovered and restored to working order. It is currently held by the Science Museum.

The Whitaker boring machine as rediscovered

A visit to the Martello Tower site found the now 20-year-old boring machine but the engineers thought it would take some £5,000 and four months to bore the test tunnel. Some common sense then prevailed and it was decided that the necessary noises could simply and cheaply be made by Royal Engineers using pickaxes or pneumatic drills in an existing railway tunnel and the listening done by "Admiralty machines".

The restored Whitaker boring machine

Things then moved quickly. The experiments were undertaken in October organised by de Salis, now the Deputy Director of Torpedoes and Mining. The trial noises were made by Royal Engineers using hand hammers and small detonators inside the Abbots Cliff railway tunnel (courtesy of the Southern Railway) which runs through the chalk cliff immediately behind the beach between Dover and Folkestone.

The sound was measured using a quartz piezo-electric accelerometer buried in the ground (rather than geophones as originally suggested). The signals received were passed through an amplifier and by the use of filter circuits the amount of noise in various frequency ranges was investigated. The signals after amplification could either be made audible by a loudspeaker or recorded graphically using a pen recorder. The listening apparatus was placed in a hole on the surface and covered with 18 inches of earth to exclude extraneous noise.

Experiments were made listening in holes at varying distances from the tunnel. The noises made inside the tunnel by the Royal Engineers were detected up to 800 feet away and railway trains running through it at between 1,000 and 3,000 feet. On the basis that large-scale tunnelling could be assumed to make a noise between these two sources it could be assumed to be detectable at distances greater than 600 feet.

Using these results it was concluded that any listening gear should be installed along the coast at five places per mile. It was estimated that the listening gear would cost £2,000 to cover a 10-mile stretch plus the cost of the 125 miles of cable and a central recording room. A team of six Royal Engineers would be needed for continuous monitoring.

Abbots Cliff eastern tunnel mouth. Photo Robin Webster, reproduced from Geograph under creative commons licence

Deferred and Forgotten

Butler's Scientific and Engineering Advisory Committees considered the experiments to be a success and that routine listening in the manner proposed if carried out over the 10-mile stretch of coast on the likely route of a German channel tunnel would provide security against a surprise invasion.

In December 1942, some 18 months after Hankey had first raised the matter, their conclusions were sent to the Chiefs of Staff who considered, and promptly dismissed them. They concluded that as the Germans could not complete a tunnel in less than three years it could not be used to invade until the autumn of 1943 at the earliest.

The matter could therefore be safely deferred until nearer this time and there was no reason to incur the suggested expenditure now. Further consideration was therefore postponed for six months. The matter was considered again in June 1943, deferred once again until January 1944 then apparently quietly forgotten.

Interestingly, and rather oddly, all these deliberations by many important people had been classified as *Top Secret* although the general public could have read about a German invasion of England via a "secret tunnel under the Channel" in *Tunnel from Calais*, a novel by A D Divine (aka David Rame) published in 1943 (and still available on the internet).

But was a German invasion of England through a Channel tunnel ever a viable option?

Tactically, of course, the idea is a non-starter. Even assuming the tunnel could have been built without Britain noticing, what would happen when it reached Kent? An exit would have had to be made into a small bridgehead This would then be heavily attacked by artillery and aircraft so the Germans could only do it if they had air superiority, but if they had this a seaborne invasion would have been a better bet. A tunnel would simply be too vulnerable and too restricted in the amount of traffic it could carry to be of any use.

On the strategic level, the RAF had won air superiority over England in the Battle of Britain before Hankey sent his first letter, and never lost it. British planners did not seriously entertain a German invasion in any form once

German troops practising for the seaborne invasion planned as Operation Sealion in 1940.

Hitler had committed the German armed forces to the invasion of Russia in June 1941.

Perhaps there was a lingering fear that if Germany could beat or disengage from Russia they could look to a new Operation Sealion but this was not credible given the growing military strength of Britain and especially after Pearl Harbor and the entry of the US into the war.

The reality of an invasion. A small part of the vehicles assembled for D-Day. Could the Germans have sent this much of their equipment through a tunnel to England?

Channel Tunnel Built at Last

A German tunnel was not credible but there was another possible threat that had concerned Britain's generals for many years: could an enemy capture a Channel tunnel which Britain had already built? Proposals for a Channel tunnel have been made since at least 1802 when it was suggested to Napoleon when he was contemplating invading England.

Since then some 138 different tunnel proposals have been put forward in Britain and France up to 1987 when digging began on the Channel Tunnel we have today. The first serious tunnel attempt was made in 1880 when the South Eastern Railway Company sank experimental shafts between Folkestone and Dover. This however led to forceful objections from the army and the government stopped any further digging.

Objections were raised whenever the idea of a Channel tunnel was raised in later years. Quite apart from political and economic considerations it was deemed militarily undesirable primarily due to the fear that the tunnel might provide a means of invading England for the French or whoever might occupy the Calais area.

In 1922 the Committee of Imperial Defence stated that a tunnel scheme would be dependent on good relations with the French who were our "historic enemy" and "… nothing can alter the fundamental fact that we are not liked in France and never will be." The 1930 scheme was also considered by the Chiefs of Staff who raised several disadvantages, notably that it would require considerable military commitment to defend it.

One of the boring machines actually used in the Channel Tunnel

The defence considerations however largely evaporated after World War II and the increase in cross-Channel traffic. When a tunnel was considered in 1949 it was thought that the military advantages and disadvantages were balanced, and in 1953 the Ministry of Defence saw a tunnel as a positive advantage in moving men and materiel to the Continent as part of a NATO reinforcement. It was however concerned that there could be no guarantee of its security in wartime nor could its destruction, if necessary, be assured.

The matter was again considered in 1957 and 1959 when a tunnel was seen, on balance, as beneficial from the military point of view but military considerations were now seen as minor compared with the political and economic arguments. However, this did not stop the Ministry of Defence from considering how a tunnel could be destroyed, which went as far as considering using an atomic bomb.

So perhaps the Ministry of Defence arranged to put a WE177 nuclear bomb in the Channel Tunnel when digging started in 1987, and it might still be there!

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RAF Barnton Quarry – Progress and Protection

Grant More and Annabel Mansell
(Barnton Quarry Restoration Team)

Looking north across the ops room floor. We built the ground floor raised platform entirely from original plans

RAF Barnton Quarry on the outskirts of Edinburgh is the site of a Cold War R4 ROTOR bunker, built in 1951. The three-level bunker was the Sector Operations Centre (SOC) for the Caledonian Sector. *Subterranea* has previously covered the work of the team dedicated to restoring the bunker and we're delighted to report on the progress of the continuing programme of work.

A changing world

In the last 18 months, restoration operations at Barnton Quarry, much like life in general, has looked very different. During the strict lockdowns, our volunteers have not been able to work underground and we've patiently waited for the go-ahead to return to more 'normal' activities.

As soon as it was safe to do so, we adapted new methods to allow us to move forward with the restoration in a Covid-safe way. We have focused on exterior tasks around the extensive grounds including felling some of the mature trees blighted by chalara ash dieback and creating a new emergency exit route at the rear of the bunker in preparation for limited public opening.

Our main funding stream is supplied by our 'mother ship' – the ROTOR R3 museum at Troywood (Anstruther), marketed as 'Scotland's Secret Bunker'.

Looking across the ground floor of the ops room in 1999. When Barnton Quarry became a Regional Seat of Government (RSG) in the early 60s floors were built across the open ops well on the two upper levels. These floors were largely destroyed during the fire of 1992 revealing the original well. Photo Nick Catford

The operations room in use in the ROTOR SOC in the 1950s

The team at Troywood have suffered the running costs of an expensive R3 structure without the usual income from visitor footfall during the Covid period. This has in turn had the effect of massively reducing the funding of our restoration project at Barnton Quarry.

However, against a backdrop of challenging times for everyone, we're pleased to report that we have made massive progress since we last wrote for *Subterranea* (# 37, December 2014).

Huge progress

Our project is broadly split into 'enabling works' and 'direct restoration work'. Enabling works typically involve spending our time installing infrastructure to support the project and our long-term aims. The restoration work means volunteers working to achieve our core aims. On a project this size, the enabling works consume as much time and effort as the direct restoration work.

In this reporting period, enabling work has involved the team constructing two new office complexes for the team; building a new access road; installing the heavy power infrastructure for the R4; installing all the networking cable, including the fibre backbones; and building a new server room.

View from the top floor down to the ops room floor. Next job is to rebuild the dwarf walls and install the ops room floor

We've also formed the largest single-piece fibreglass warm roof in Scotland for the surface SOC building, covered the whole 16-acre site with state-of-the-art CCTV and virtual perimeter detection, cut down lots of trees, and carried out a lot of landscaping and ground works.

As for direct restoration work, we have been systematically restoring the bunker, working top-to-bottom and back-to-front within the R4. The top floor is largely at first-fix state, ready for decoration. We've restored the ceiling (a massive, dirty glass-blasting job) and installed cabins to the original R4 specification. We've remade and installed hundreds of metres of air ducting to the original specification and installed all the necessary cabling for the interactive museum.

Counter intuitively, one of our most successful pieces of renovation in the last few years actually involved quite a bit of destruction...

Middle floor cabins. We've faithfully reproduced the raised floors per the original Mott, Hay and Anderson implementation

Removing the RSG's old RSJs

Like many other ROTOR sites, the R4 has been subject to several modifications to suit the evolving needs of the military and of government in the past seventy years.

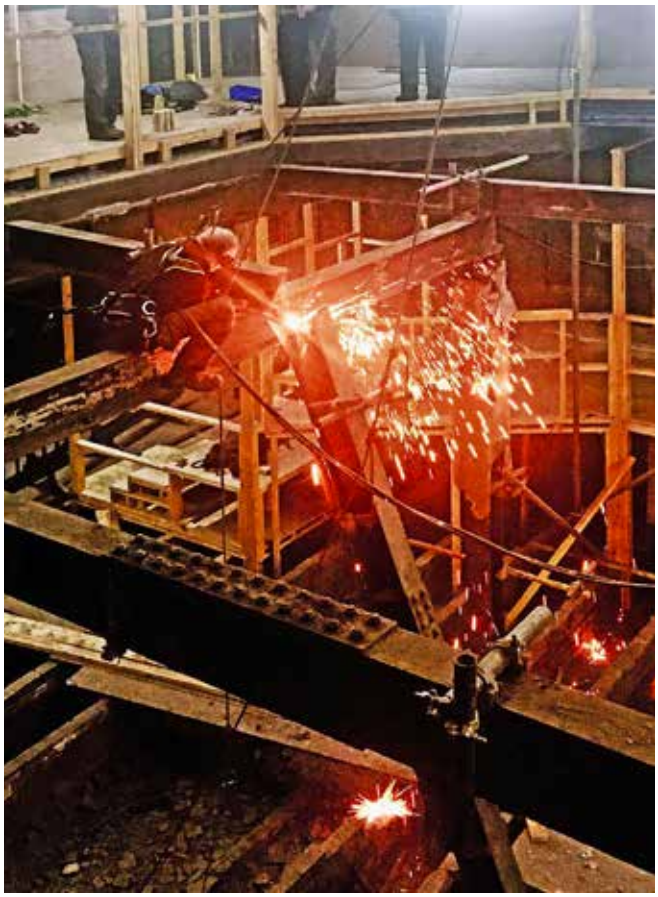
One of the most dramatic modifications was the flooring-over of the original operations well during the conversion to Scotland's Regional Seat of Government (RSG) in 1960. This involved RSJ (Rolled Steel Joist) supports for new flooring to extend the two upper floors over the full area of the bunker.

As a result of the major fire which swept through the bunker in 1993, there was substantial damage to this structure such that the floors had burnt to ash and rained down into the core of the building, with only the metal RSJs remaining in place. Our vision is to restore the original ROTOR R4 configuration, so the task of removing the redundant RSG frame was passed to the restoration team.

Removal of the joists was a mammoth achievement involving a large number of the restoration team working closely together. Each joist was carefully cut with an oxyacetylene torch by a volunteer suspended from the ceiling. Once separated, the joist sections were lowered to the floor before the uprights could finally be felled.

Removal of the RSG frame. Fortunately, several members of the restoration team are qualified and skilled at working at height. This was a real high water mark for us as it revealed the open operations room for the first time

Luckily the team has a number of theatre riggers and a tree surgeon amongst our number so the rope work, although challenging, was all handled with volunteer safety first. The joists were then broken down into further sections and manually removed up three floors and along the access tunnel to ground level – no mean feat as this was several tons of metal!



Removal of the RSG frame

This has made a massive visual difference in the ops room and has provided us with the space we need to work on the cabin window apertures, including lifting the large glass windows in and to lay the new ops room floor.

Our sister team preserving the R3 at Wartling in Sussex have very kindly donated and transported the remains of their original teak ops room floor to us and we hope to work this recovered material into the new floor. We plan on retaining the ROTOR heritage and original features as much as possible.

Another successful restoration was of the air-handling plant room at the rear of the complex. We reused much of the original galvanised steel conduit as the containment for new cables, which we pulled in after removing the cloth-covered originals from 1951. We were able to reuse many of the beautiful enamel light fittings, installing low-energy lamps to emulate the original bulbs, in-line with our 'modern but original' policy.

Official Listing

We were delighted to be awarded Category-A listed status in June this year by the government body responsible for listed buildings, Historic Environment Scotland (HES). A significant milestone on the journey to opening the site as a museum and education centre.

Removal of the RSG frame

Category-A listed building status is awarded to buildings of special architectural or historical interest which are outstanding examples of a particular period, style or building type. This is broadly equivalent to Grade I listing across England and Wales. Recognising both the national, historical and architectural importance of the

site, the listing elevates Barnton Quarry alongside other unique and notable historic buildings such as Edinburgh Castle and the Forth Rail Bridge.

HES note in their listing report: "The R4 ROTOR bunker is an extremely rare example of an early Cold War ROTOR radar headquarters and is the only example where the original layout is visible.

"The buildings are a well-preserved physical reminder of two of the major global periods of conflict that helped define the 20th century (being World War II and the Cold War), and in both cases many of their contemporary related structures have been either heavily altered or demolished, further adding to the significance of these surviving examples."

"A rare survival"

Philip Robertson, Deputy Head of Designations at HES, said: "We are delighted to list the Cold War ROTOR Radar System bunker in Barnton. This follows the nomination of the site by The Barnton Quarry Restoration Project, a community group involved in restoring the building as a unique piece of Cold War history in the heart of Edinburgh.

"Working with community groups and listening to their ambitions to protect and engage with their local historic environment is a priority for HES. Listing at Category-A recognises the special architectural and historic interest of this building. As one of only four purpose-built radar system headquarters of its type in the UK, the Barnton building is a very rare survival from the Cold War."

Restored bathroom in the surface SOC. We were able to restore the original 1940 urinals and we've been able to source fittings to suit the period

A decade of hard work

Our team of dedicated volunteers has been working hard on behalf of the public for the past ten years to painstakingly restore the buildings. We're deeply passionate about safeguarding our Cold War history and this award will help us to accelerate the realisation of our vision of opening the site at Barnton Quarry as a museum and education centre.

The Category-A listing is also a first for any ROTOR site, and it sets a welcome precedent for the preservation of other Cold War infrastructure across the UK. The protection is complemented in England by ROTOR sites at Portland (Scheduled Monument) and at Neatishead and Hope Cove (both Grade II listed).

Server room in the surface SOC. These racks will contain the servers which power the interactive exhibitions

It also reminds us that we are custodians of our national heritage, preserving and keeping these historically important buildings alive on behalf of the general public.

Against a backdrop of exceptional macro uncertainty, the listing will help us to lead the right path for the future of the site and help us to prevent detraction from the core goal of the restoration project, which is to faithfully preserve the buildings per the ROTOR R4 period, expose the history and of course open the site to the public.

Air handling plant room restoration. We were able to save the original fittings and most of the original steel cable conduit. If you look closely you'll see our security cameras and wi-fi access points blended to match in with the original ROTOR conduit

Doors Open Days

At the core of our restoration project is the long-term goal to open to the site to the public. There has been intensive public interest in the project and we were invited to take part as the showcased site for the Cockburn Society's *Doors Open Days* initiative in both 2018 and 2019. This programme offers free access for the public to sites around Edinburgh which are not usually open to visitors.

The event is very much aligned to our big-picture goals and we have been delighted to support the initiative. We offered 3,000 tickets each year and on both occasions

tickets were all snapped up by members of the public within 24 hours of being made available, with many more people joining waiting lists.

As we've been able to systematically reduce the risks of what was a very dangerous and derelict site, it has been possible for us to open up limited areas during the events. The WWII operations well on the quarry floor was used to display an exhibition of information, including a restoration timeline, whilst the side offices housed an informative talk from the historical members of our team and a number of photo walls.

We welcomed 3000 visitors to Barnton Quarry as part of Doors Open Day. One of our passionate volunteers explains the construction of the R4 tote to our visitors

In 2019 we were able to offer the public a safe walk around the perimeter of the top floor of the R4 operations well. This would have been unthinkable as recently as 2017 due to the condition of the building.

Many visitors had personal connections to the bunker, regaling us with stories of family members who had worked at Barnton Quarry during the active years as there was a peak staff of nearly 400 (mostly on National Service) in 1956, working in three shifts around the clock.

Next steps

We have had significant public interest in the restoration and we're constantly inundated with access requests by people interested in visiting the site. Unfortunately, we simply don't have the staff on the restoration team to manage visitors. We have therefore been exploring how we can safely allow access while allowing restoration operations to continue. Our main focus now is therefore the enabling work to allow public access for our forthcoming *Hard Hat Tours*. We will be opening as a 'work-in-progress' museum to groups of guided visitors.

We have a substantial planning application underway to allow us to move the site from commercial use Class 6 (storage) to Class 10 (museum), which will enable us to open to the public as a museum. A huge amount of preparatory work has been put in by our architects and the restoration team not only to prepare the necessary reports and paperwork, but to foster public support.

It's looking very good at the moment and we anticipate no roadblocks in our way, especially with the recent listing. The *Hard Hat Tours* will provide a mechanism to manage public access while simultaneously allowing us to raise funds to continue the restoration project.

Our restoration team is comprised entirely of volunteers. Enjoying a pizza after welcoming our visitors during Doors Open Day

Our restoration team is comprised entirely of volunteers. We see ourselves as guardians of our national history, a role that we take very seriously as the restoration of derelict ROTOR sites is typically a loss-leading exercise and the volunteer model is (as we see it) the only model which enables this kind of project. We're deeply passionate about preserving the site and have contributed tens of thousands of hours to the preservation of ROTOR history. We're half way through, but there's still a long way to go.

Appreciation

We are grateful for the unwavering support we receive from Sub Brit, both directly and indirectly via the membership. A special thankyou to our Sub Brit friends Bob Jenner and Mark Bennett for their original research which helped us to establish not only the location, but images of the Barnton Quarry standby generator house. This was located some 0.9 miles from the bunker in a standard ROTOR standby set house building (sadly demolished in the mid-1960s to make way for a nursing home!).

We're planning to host a visit event exclusively for Sub Brit members during your Autumn Weekend, currently planned for August 2022. We look forward to seeing members old and new and to continuing to share our passion for this fascinating chapter of the UK's history.

All Photos from Barnton Quarry restoration team unless stated

Where Britain at War Guarded Her Art Treasures

Stewart Wild

In the dark days of World War II almost everything was, to a greater or lesser extent, secret. People relied a lot on the BBC for news of the war effort and all newspapers and magazines, woefully thin due to paper shortages, were censored.

Picture Post

Most magazines had stopped publishing; one that managed to continue throughout the war, however, was *Picture Post,* price fourpence, published weekly by Hulton Press. It was printed in an unusual portrait format of 13 by 10 ins (325 x 250mm), in black and white with the addition of red on the cover. The paper was thin, and the advertisements carried a general warning: "*The fact that goods made of raw materials in short supply owing to war conditions are advertised in this paper should not be taken as an indication that they are necessarily available*."

Picture Post, which began as an anti-Fascist broadsheet in 1938, was immensely popular and sold over a million copies a week, rising to nearly two million in 1943. It was a pioneer in photo-journalism. The magazine closed in 1957 and its vast photographic archive of some fifteen million pictures is now owned by Getty Images.

The magazine carried a wide range of articles of a political and social nature, often with news of the war from the front line, redacted where necessary, and always accompanied by copious well-captioned pictures. Over the years I have collected a number of well-worn copies from the wartime period, and I found an article in one of them, dated 7 November 1942, that I thought might be of interest to readers of *Subterranea*.

Museum treasures go underground

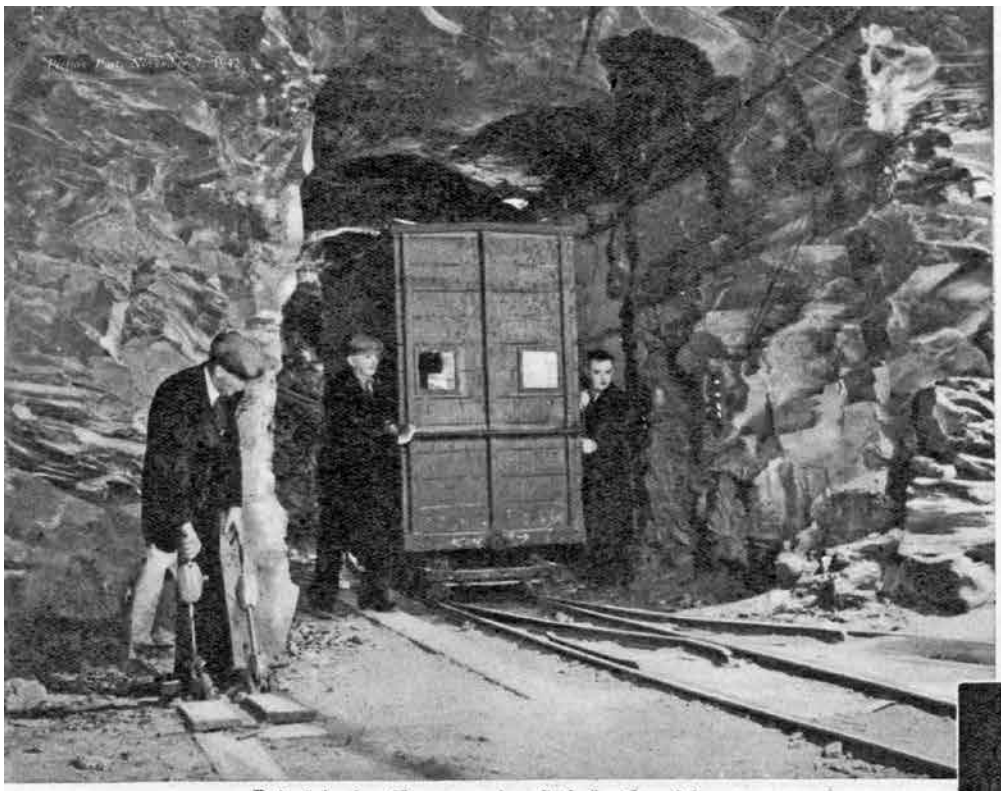
Before and during the war most of London's museums found shelter for their valuables and works of art underground in basements, tunnels and mines. Many paintings were evacuated to castles in distant North Wales, hopefully safe from bombing. In 1940, there were suggestions that some National Gallery art should go to Canada. Winston Churchill apparently telegrammed director Kenneth Clark: "*Bury them in caves or cellars but not a picture shall leave these islands*."

Thus, in utter secrecy, a mountain quarry near Blaenau Ffestiniog in North Wales was selected, and its tunnels made ready to shelter the National Gallery's most valuable works of art.

One of the surviving storage rooms at Manod. Photo Martin Pritchard

Manod Quarry Reveals its Secrets

We reproduce on the following four pages how *Picture Post* informed its readers that the nation's art treasures were safe from German bombs. Full conservation details and copious photographs reveal astonishing and precise information, except of course, the exact location. I'm sure that the magazine editor, unnamed photographer and removal men were all made to sign the Official Secrets Act. For many years even local villagers had no knowledge of what was kept inside their mountain. After the war the paintings were gradually returned to London, but the site remained a secret "prepared location" until the end of the Cold War. Now its story can be told.



Britain's Art Treasures Are Safe Inside a Mountain

For the war the National Gallery pictures are kept hundreds of feet below ground. When they are moved they travel in a specially sealed and heated trolley which keeps an even temperature.

BRITAIN AT WAR GUARDS HER ART TREASURES

One kind of property that could never be replaced if bombs or fire damaged it. Pictures from the National Gallery are safe for the war—and never before have they been kept under such good conditions.

IN caves as fabulous as those of Haroun al Raschid and secure as the vaults of the Chase National Bank, a part of Britain's treasure lies buried. It is literally priceless; even if its market price could be assessed like that of gold and diamonds, it would still be impossible to translate into terms of money what its loss would mean to Britain and mankind. For the treasure consists of the pictures of the National Art Gallery, our heritage of the world's genius, the civilised trust which has accumulated to us from the past and which we must hand, undiminished, to posterity.

The decision to remove the pictures into safety was taken in the year of Munich. The actual transfer took place shortly before the outbreak of war. With great pains, the scientific adviser of the National Gallery, Mr. F. I. G. Rawlins, had explored the caverns and mines of England and Wales in order to find an impregnable shelter. He found in a cliffside a cave, 600 feet below the surface, with a long narrow corridor, leading for almost a quarter of a mile into solid rock. In its original condition, it was unsuitable for storing pictures. It was too low to admit the massive Rubens and Rembrandts. Worse than that, it was damp. At the suggestion of Sir Kenneth Clarke, director of the National Gallery and Mr. Rawlins, the Office of Works applied itself to converting the caves not merely into a bomb-proof shelter but into a scientific storage chamber where the pictures could be even better preserved than when they were on public exhibition. They widened and heightened the corridors, installed a rail-track for smooth movement of the crated pictures, enlarged the storage vaults and air-conditioned them in order to control their humidity. Don't imagine these caves like the dank cellar of your grandfather's house. They are brilliantly lit by electric light from the main supply. In case of failure there's a relief engine, important for air-conditioning rather than for lighting.

The function of an Art Gallery is more than to be discriminating in buying pictures and judicious in displaying them; their preservation depends on continual care. All the pictures in the caves are hung, and are inspected daily for damage. This damage can come either from external blows or from the gradual changes imposed by time. A picture is like a painted door. You know how on a door the paint is apt to blister, the panels to crack. In the case of a picture, the most skilful craftsmanship is needed to make the blister subside or to fill the crack. The National Art Gallery has, as its "restorer," Mr. W. A. Holder in whose family the craft has been handed from one generation to another since the days of Sir Joshua Reynolds. He has a studio in one of the caves and here he secures the blisters, fills them and irons them down. Another form of damage is the accumulation of grime. A solvent, one part spirits to nine parts turpentine, will clear the crusted dirt and reveal the glowing colours of the original. But don't try restoring Old Masters yourself. The amateur is best advised to limit his experiments with turpentine to removing spots from an old raincoat.

The Secret of Restoration

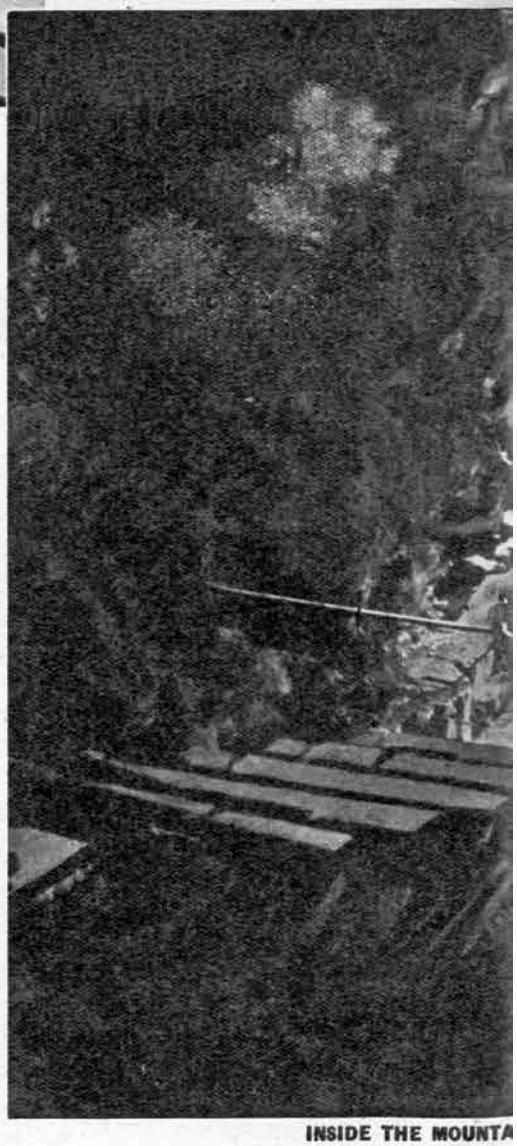
But some of the greatest damage to pictures has been done by those professional restorers who regard their work as an art and not a craft. They've taken, for example, an arm or a leg or a sky in a picture, which time has blistered or eroded and painted-in their own idea of what it ought to look like. The result has been an ugly hybrid which destroys the beauty of the original fragment. Restorers of this kind have sometimes gone from bad to worse by overpainting the original to correspond with their additions. This vandalism can only be compared with that of an editor who might first complete an unfinished sonnet of Shelley; then strike out and re-write the beginning in order to harmonise it with his ending; and then pass off the completed poem as a sonnet of Shelley. Genuine restoration, such as takes place in the National Gallery's underground studio is only concerned with revealing what the artist himself created. By delicately removing the incrustations, the restorer gives back the lustre of the centuries-old unfading colours.

Science has allied itself to his handicraft. By means of X-ray, the director of an art gallery can now see beforehand what lies beneath the grime. He can thus prevent what sometimes has happened with the most skilled restorers—the removal of the original owing to the shallowness of the paint. In the same way, he can decide whether it is practicable to reline the canvas on which the picture is painted. And yet, it's not the amount of his scientific equipment which makes a good curator. Above all, he must have aesthetic sensibility, so that his decisions, sometimes irrevocable, may serve the artist's intention and not destroy it.

Guards Against Theft and Climate

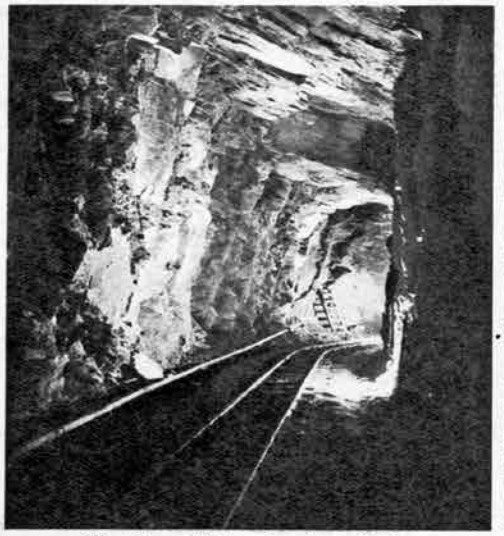
The storage site is a well-kept secret. Next to precious jewels, objects of art are the most attractive valuables for the war-time thief. Before the war the picture-thief, usually helped by a dishonest dealer who was none the less a connoisseur, used to

Continued overleaf



INSIDE THE MOUNTA

The corridor was less than six feet high

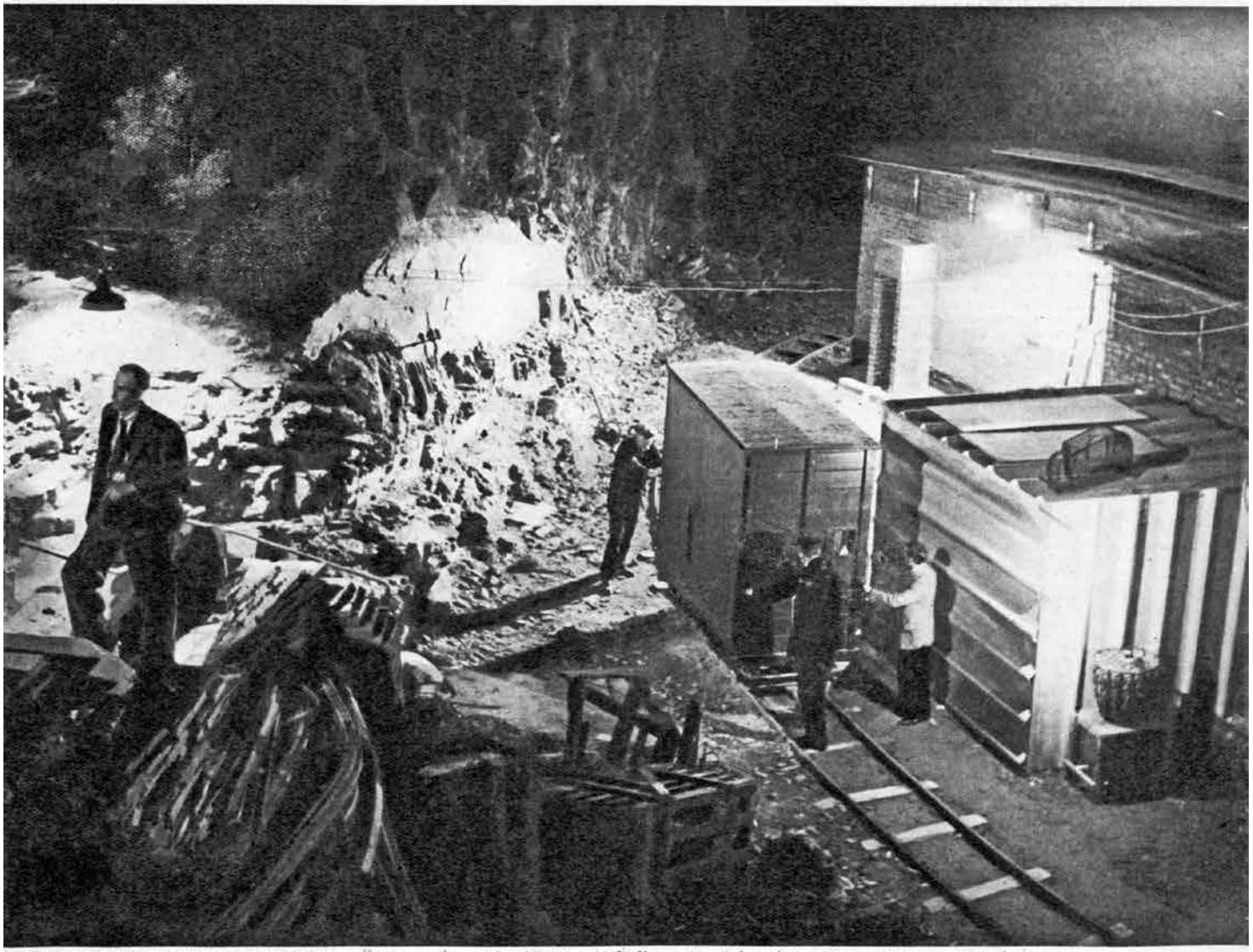


The Tunnel That Leads to Safety

For four hundred yards it runs into the mountain. At its end is the war-time art gallery.

The Rock That Guards the Treasures

The name of the place is secret. Only a few may pass beyond the door. Villagers who live near don't know what is kept inside the mountain.



IN THAT HOLDS PRICELESS TREASURE: *Pictures from the National Gallery Are Moved to Their Storage Chambers before it was taken over for this purpose. Now it has been widened and heightened. Air-conditioned chambers have been built for hanging the pictures; moisture is controlled. Damp is the great enemy, but never before have the treasures been hung under better conditions.*

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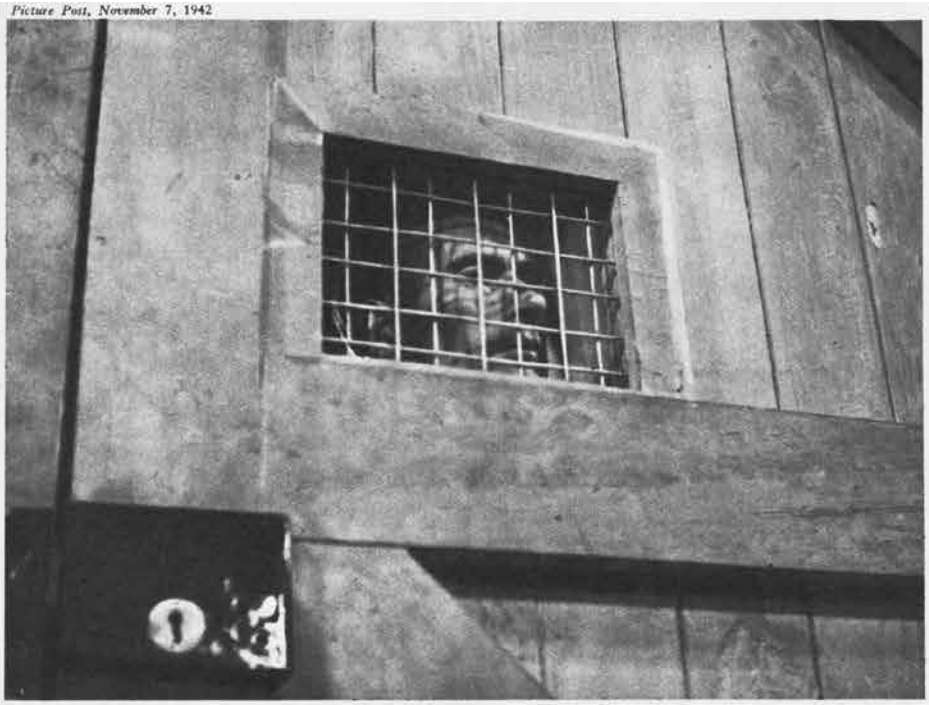


Pictures by Veronese Are
"Darius before Alexander" hangs in the background. On room where a constant

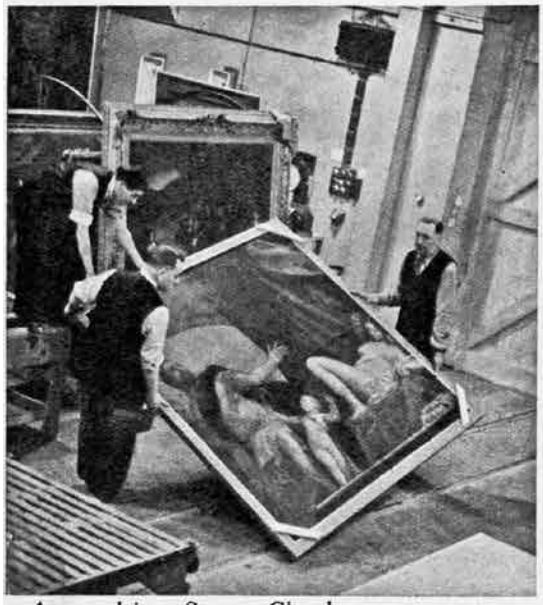
INSIDE THE MOUNTAIN ART GALLERY

A night guard looks at one of the greatest art collections in the world. He is one of the few men who can look at them whenever he likes.

find a market in America. To-day, when the value of bonds and shares and money fluctuates, Old Masters have an unequalled investment value for the mercenary. Fortunately, the pictures of the National Art Gallery belong to the British people for ever. The thief who would like to lay his hands on them is more likely to get a bullet than a picture, for the permanent guard is armed. Against changes of temperature a guard is kept by scientists who keep a careful eye on the hygrometer. The French evacuated many of the Louvre pictures to Châteaux, quite unsuitable for storage because of their dampness. They suffered in consequence. The Spaniards sent a priceless collection of pictures from the Prado in Madrid to Lausanne. Through faulty packing, some were damaged on the journey. With great prevision, Sir Kenneth Clarke and his

The Daily Dusting
Below, on right, is Rembrandt's "Saskia as Flora," a recent purchase.

The Director of the National Gallery Takes Out a Jan Steen
Sir Kenneth Clarke examines a picture from the Royal collection. The King is sending it to New York for an exhibition in aid of the Dutch.



Arranged in a Storage Chamber
the wall is a hygrometer for measuring moisture in a temperature is essential.

A Picture is Cleaned
Sir Kenneth Clarke watches the expert restorer, W. A. Holder, whose family worked for Sir Joshua Reynolds.

assistants have made scientific arrangements not only to guard the pictures from outside dangers, but also from the insidious danger of deterioration.

We're inclined to cherish the things we love only when we're about to lose them. So with the treasures in the National Gallery which so many millions of us ignored when they could be seen for the cost of a bus-ride.

When once again we can look at these pictures—and perhaps, by the end of the war, helped by the Council for the Encouragement of Music and the Arts, we will have abandoned our snobbish idea that the appreciation of pictures is intended for the few—on that day we will recognise with gratitude what devotion has gone into their care and the motive which inspired it.

A Masterpiece Has to be Moved to the Restoration Studio
It stands in the great hall at the end of the entrance tunnel. Workmen are preparing to move it to the special trolley.

"All Well." A Night Guard Checks Up
A night guard stops on his rounds to telephone to the guard room.

Crystal Palace Subway Restoration Update

Richard Wade and Sue Giovanni (Friends of Crystal Palace Subway)

Proposed roof and restored courtyard interior (Thomas Ford & Partners, May 2021)

Many people walk, drive or take the bus along the very busy Crystal Palace Parade in south London without having a clue they are passing over the amazing vaulted, Victorian-built Crystal Palace Subway. Opened in 1865, the Subway is rumoured to have employed highly skilled Italian bricklayers and stonemasons to craft the splendid columns and ceiling hidden beneath what is now the busy A212 between Lewisham and Croydon.

Thankfully, now a £2.8m restoration project is underway, that is about to change. The enclosure of the Subway site with hoarding is already causing many to ask "what is going on?" and "what is there under the road?"

Hidden under the Parade, the Subway is a unique reminder of the history surrounding Thomas Paxton's Crystal Palace. It has outlived both the Palace (destroyed by fire in 1936) and the High Level Station it connected to (demolished in 1961).

A previous report in *Subterranea* 36 (August 2014) provides background on the construction, history and use of the Subway and we are picking up the story from there.

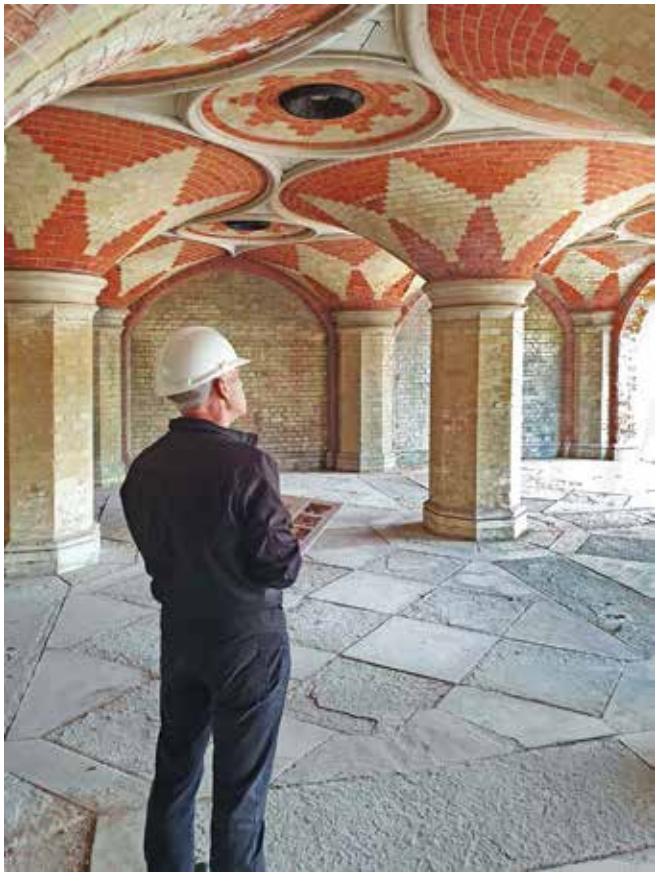
Restoration and funding

The Friends of Crystal Palace Subway have been fronting the strong community drive to improve awareness of the Subway and make it more accessible. Great cooperation between the FCPS, Bromley and Southwark Councils resulted in funds being raised to reinstate safer access to the Subway via steps at the west (former station) side of the Parade in 2016.

The Subway site on Crystal Palace Parade now surrounded by hoarding featuring Lionel Stanhope artwork
Photo: Richard Wade, FCPS June 2021

Then in 2019 the combined efforts of the FCPS, Bromley Council, Southwark Council and Historic England led to the announcement that £2.34m of funding had been

secured from the City of London strategic investment pot with the aim of restoring the Grade II* listed Subway and removing it from the "at risk" register. Historic England has also contributed a further £500k.



Condition survey – Clive England, architect and Project lead Thomas Ford & Partners capturing the condition of every brick and location of cracks
Photo: Richard Wade, FCPS August 2020

The project started in early 2020 with the appointment of Thomas Ford & Partners as the conservation architects and lead designers to assess the state of the Subway and produce plans for its restoration.

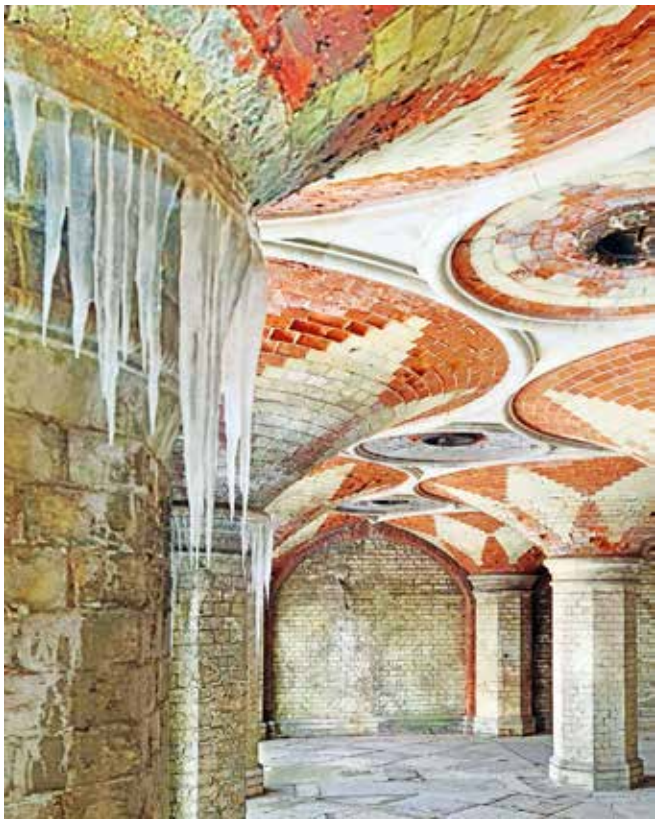
TF&P have a great pedigree with many successful historical and cultural restoration projects and are using a team of specialist consultants including ecologists, structural engineers, digital surveyors, environmental and brickwork specialists to assess and advise on the restoration. Despite the pandemic much progress has been made.

A major clearance of the overgrown vegetation in the grounds and brickwork surrounding the courtyard in August 2020 allowed detailed survey work to be undertaken. The clearance also exposed the remains of the two southernmost sets of stairs that led into the Crystal Palace. Unseen for decades, they are in a poor state but more remains than had been expected.

Ecological surveys have assessed the impact on local wildlife. A key conclusion is that the bats in the area are not roosting in the numerous crevices in the Subway brickwork, most likely preferring the nearby Paxton Tunnel – another legacy from the High Level Branch line built to serve the Crystal Palace.

Once the site had been cleared a digital laser survey was carried out producing a detailed point cloud capturing data from all the site. This was then used to produce detailed 2D plans including input to the survey that captured the condition of every brick and location of every crack throughout the site.

Detailed research of historical data and photographs has also helped shape the restoration proposals. The full plans were submitted in May 2021 and are currently awaiting planning approval.



Water seeping through from the road above is causing damage to the brickwork. Icicles formed at various points in the Subway during the winter freeze
Photo: Richard Wade, FCPS February 2021

What will happen

The flaking and water-damaged brickwork within the subway area will be repaired and made watertight. Specialist consultants are advising on the brick type and colour to closely match the original where replacement is necessary.

The courtyard area will be transformed once again making it a safe – and usable – space. The brickwork will be restored and the northern wall that is in a very precarious state will require complete reconstruction. The flooring will be returned to the original patterned design some of which can still be seen under the debris that covers the courtyard today.

The four stairways leading to the park will be reinstated and secured with custom-built solid, wooden panelled doors that slide into recesses in the brickwork. The design will closely match the original wooden sliding doors, unique for their time, based on meticulous research of

photos before and after the 1936 fire and evidence of the runners and wood construction found on site.

A striking new metal and glass roof covering the courtyard that will be visible from Crystal Palace Parade has also been proposed. Internally the metalwork will reference the original double pitched structure but without internal cast-iron columns, creating a far more flexible space. Externally a single pitch addresses the requirements for security, air circulation and ease of ongoing maintenance.

Crystal Palace Subway courtyard - current condition. Photo Richard Wade, FCPS June 2021

What next

Subject to planning approval, contracts will be placed and restoration work will start later this year with a target completion date of Autumn 2022.

The aim is to restore the Subway and open it for use as a community / historical venue for all to enjoy. Local awareness has already increased with the site hoarding now featuring iconic Crystal Palace High Level Station railway signage from local street artist Lionel Stanhope – a public poll resulting in an overwhelming preference for a traditional railway green and yellow themed design.

And once the new roof rises up from the courtyard and the hoarding is removed those passing along Crystal Palace Parade will be far more aware of what lies below. They will also have far more opportunity to visit, use the community space and see the wondrous brickwork for themselves – as will future generations.

More information

In addition to the previous *Subterranea* article and photographs (Issue 36 August 2014), there is historical background and timeline information on the Friends website www.cpsubway.org.uk FCPS are also providing regular social media updates: Facebook / Instagram / Twitter @cpsubway

Exterior view of the proposed new courtyard roof and restored park-side entrances (Thomas Ford & Partners, May 2021)

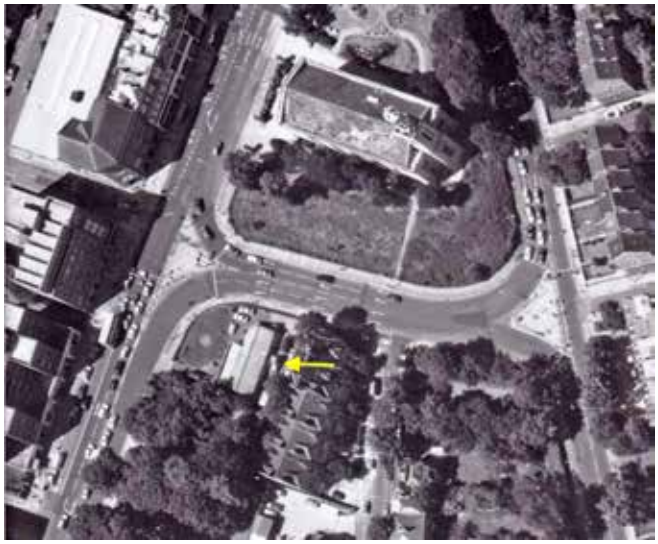
Lambeth Borough Control, south London

Nick Catford

During the Cold War London was divided for defence purposes into four (later five) groups, each reporting directly to Kelvedon Hatch RGHQ. Each group was subdivided into the individual boroughs, each of them having its own control centre.

The South West Group War HQ at Churchill Road, Cheam had six sub-controls: Wandsworth (D1), Lambeth (D2), Merton (D3), Sutton (D4), Kingston (D5) and Richmond (D6). Also the Police District War HQ which was at Sutton Police Station.

The Lambeth control, designated 51D2, was located beneath the Civil Defence training centre in St Matthews Road at its junction with Brixton Hill, SW2, just south of Brixton station. The entrance was down a steep flight of steps on the east side of the building with an emergency escape shaft and ladder in the car park.



Aerial view of the Civil Defence control centre. The entrance to the bunker can just be made out on the east side of the building. The steep slope of the entrance steps is clearly seen. The arrow indicates the entrance steps into the bunker. Photo from Simmons Aerofilms

The bunker and training centre were built in the early 1950s. When the Civil Defence Corps was stood down in 1968 the training centre was no longer required and the building became the St Matthews Road community centre. Such centres consisted typically of typically a small hall with kitchen that could be hired for parties, wedding receptions, playgroups, jumble sales, scout groups etc. The bunker below remained in use. During the miners' strike in the 1980s the community centre was used by the Lambeth miners' support group and visiting miners from South Wales.

The bunker was decommissioned c.1992 following the end of the Cold War in 1991. During the 1990s it was used illegally for raves/parties for a number of years and at one time had squatters. A post on a Brixton forum in 2009 states "We squatted the bunker on Brixton Hill for about 6 months about ten years ago and did indeed do some squat parties. It was quite small (5–6 rooms) and only one steep staircase entrance. When it got too hot down there, we used to have to put on the ventilator fan which drowned out the music in all three dance rooms. Happy days."

Another person commented, "I remember those parties, they were great, went a few times, but thought it was longer than ten years ago, was it the one opposite St Matthew's Church? The toilets were all smashed to bits, and that staircase was often so stuffed with people that no one could get up or down. It did get hot down there; I wasn't surprised when it got closed up, it must have been a real fire hazard waiting to happen."

The Civil Defence training centre. The entrance to the bunker is out of view behind the building. Two civil defence vehicles are seen. The left-hand one is a Land Rover 88 Series 1; the Civil Defence Corps had a large fleet of them. The other vehicles looks like a Commer Q25, a model introduced in 1939.

Another post to the forum in August 2021 added further to the story, "I lived on Rushcroft Rd and until '85 or '86 our residents' association hired the St. Matthews community centre for our AGMs. For a local group like that the hire fee was something like 20 quid for the evening. Around '86 the council raised the cost of hire to £300. Nobody was willing or able to pay the new rates, and the place fell into disuse, giving the council the excuse to close it.

At some point in the mid or late 90s it was squatted. If I remember correctly the leading squatter was Irish Des (R.I.P.), a celebrated (or notorious) figure on the local squatting scene. He was assisted by others including Glynn and Phil who lived on Rushcroft Road and briefly ran an unlicensed club (the Penguin) in a squatted railway arch on Station Rd around this time, until grassed up by Dogstar Larry.

When they discovered the bunker they had the idea of turning it into some sort of shebeen, but it was quickly clear that it wouldn't be practical or safe.

I went down there a couple of times. Entry was via a steel ladder down a shaft, there was no power or sanitation, and I think ventilation and fire safety would have been serious issues. There was a huge, ex-War Department diesel generator in a small back room that looked like it hadn't run in decades. When it became obvious that there was no profitable use to be made of the bunker, Des's attention turned to the possibility of dismantling the generator so that it could be removed and sold. I don't know if he managed it. I can't remember if the squatters left or were evicted, but when they'd gone the council promptly demolished the building. I was told they'd sealed the bunker entrance with concrete."

The surface building and bunker entrance were demolished c.2004 and the site is now the Brixton Orchard (a community green space). It is assumed that the entrance stairway has been backfilled and the bunker remains intact below ground.

The urban designers working on the Brixton masterplan which was commissioned by the London Borough of Lambeth in 2007 stated: "open and refurbish underground bunker on Brixton Hill" is one of a number of "potential projects for investigation".

No photographs have been found showing the inside of the bunker or its entrance.

Nonsense from Merstham, Surrey

The following two letters were published in the *Journal of the Railway and Canal Historical Society,* issues 12 and 13, in 1966 – 67.

(1) An enquiry ..

Harrison, Mullens W., 1966, Merstham-Newbridge Canal. *Jl. Railway and Canal Historical Society* 12, page 70 [Letter: An effort is being made to discover whether the Merstham to Coulsdon end of the Merstham to Newbridge Canal (authorised in 1811) was actually made under the North Downs, either to Coulsdon or even to Croydon. Soon after I moved to this farm from Caterham some 18 years ago, I met a lady who asked me to show her the way to the underground canal to Croydon, through which she had walked as a girl of 15 with her father and a geologist. She looked about 60 then, so her walk to Croydon must have taken place about 1900 – the year in which the second Merstham Tunnel was constructed and all the Roman caverns in the Lower Chalk open for anyone to explore. Has anyone any information about this?] [SEE: R.A. Evans, ????, Merstham-Newbridge Canal in Jl. R.C.H.S. 13, 18 – 19]

(2) A reply …

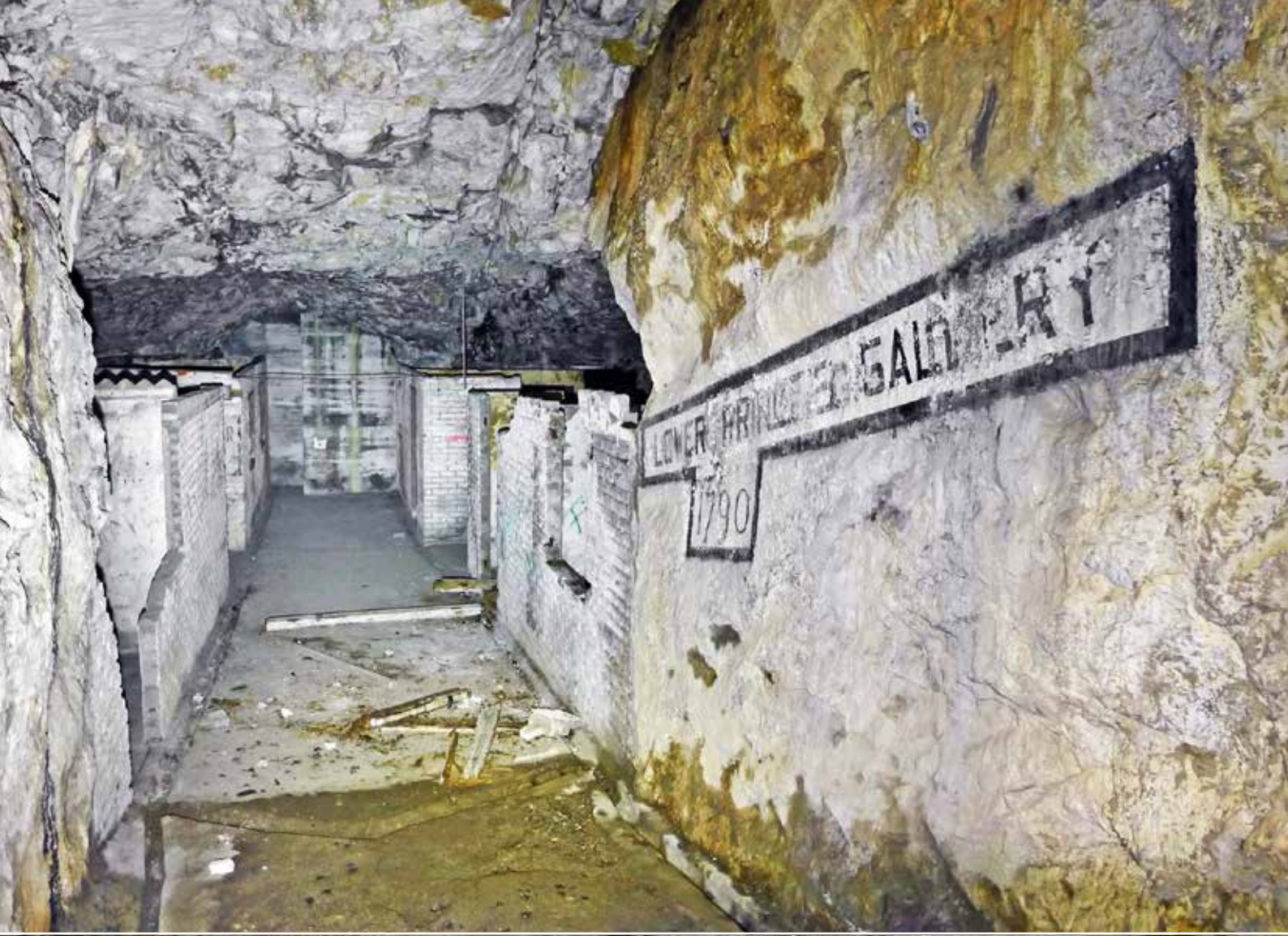
Evans, R.A., 0000, Merstham to Newbridge Canal. *Jl. Railway and Canal Historical Society* 13, 18 – 19 [Reply to a letter from Mullens W. Harrison of Quarry Dean, Merstham (qv) in Jl. R.C.H.S. 12, page 70 (1966)] [A letter on this subject appeared on p. 70 of the October 1966 *Journal*. Mr. R.A. Evans, in conjunction with the Archaeology Division of the Ordnance Survey, gives the following information: The archaeological records have been searched without success. The nearest thing seems to have been the Rennie's project for a canal joining up the Croydon Canal with Portsmouth: this was proposed in 1803, but ran into opposition and the Act was never passed, so it is very unlikely that any tunnelling was done on connection with it. The Ordnance Survey think the lady's story was based either on a privileged walk through the railway tunnel before it was officially opened, or on some imperfectly remembered exploration of hearthstone quarry tunnels which are in evidence at Caterham and Godstone, or the Malmstone quarries in the close vicinity of Quarry Dean Farm. The hearthstone tunnels are probably the 'Roman Caverns' referred to: the chalk caves under Reigate Castle are sometimes known as the Roman Caverns [The quarries lying alongside the Roman Road between Caterham and Godstone are believed to have been originally worked by the Romans – Ed]]

(3) A 2014 commentary …

Mullens W. Harrison intimates in his letter that he took over Quarry Dean Farm, Merstham, in 1948, having moved there from Caterham, which is around four kilometres away. Adjoining the farmhouse was the large chalk pit, which had recently gone out of production, worked at the end of its life by the Merstham Greystone Lime Company Ltd, and before that by members of the Peters family, a partnership of the Hall Brothers, and (from around 1807) by the early civil engineering partnership of Jolliffe & Banks. In and near the adjoining orchard entrances were made into flooded underground quarry workings, which too had been worked by Jolliffe & Banks. Harrison invited cavers to investigate, and one Noel Dilly made a plan of the then accessible tunnels and deposited this, with a report, in the library of the Surrey Archaeological Society.

Harrison's quiet enjoyment of his historic farmhouse was threatened firstly by the County Borough of Croydon, despite objections, using the chalk pits as a landfill site; and secondly by the planning and construction of the M23 motorway which was built across the landfill and across the site of his farmhouse, which was demolished in 1972. Sadly, he died the following year. He seems, unsuccessfully, to have used the flooded 'caverns' under the farm in support of his objections to the landfill and then the motorway, on the grounds that the former might pollute the groundwater, and the latter pose serious ground stability problems.

Both Harrison and Evans shew little understanding of the geology of east Surrey! No 'caverns' have been recorded in the Lower Chalk at Merstham (the nearest is in Middle Chalk three or four kilometres to the west at ????). The 'caverns' at Merstham are stone quarry tunnels in the Upper Greensand, the bed below the lower chalk. The 'caves' under Reigate castle are dug in Folkestone Sand.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